MODEL
AIRPLANE NEWS
MASTER THE SLIP —PAGE 10

THE WORLD'S PREMIER R/C MODELING MAGAZINE

48120

September 1995

10 GREAT HOW TO'S FROM THE PROS

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SEPTEMBER 1995 VOLUME 123, NUMBER 9

MODEL AIRPLANE NEWS

ON THE COVER: giant-scale models like this Aeroplane Works Fokker D-VII require control systems that are reliable and properly installed for safe and enjoyable operation. See page 30 for Frank Ponteri's article on commonsense control for giant-scale models. (Photo by Sal Manganaro.)

ABOVE: the Big Peashooter—Henry Haffke's new, giant sport model is easy to build and fly. See the construction article on this great IMAA-legal airplane. (Photo by Gerry Yarrish.)

FEATURES

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

TOM ATWOOD

RACING BIPES AND NEW AIRFOIL DATA

We all know racing can be fun, but giant-scale racing is really big fun with a lot of action, power and drama. True, the competitors themselves are a rare breed of R/C sportsman, but the technology they pursue (which filters down to the sport modeler) and the publicity the races generate benefit everyone in our great sport.

Is Chip Hyde preparing for a race or an aerobatics competition? His Bob Godfrey-designed balsa-and-foam Ultimate Bipe now qualifies for the new sport-biplane class at the Madera giant-scale races.

We were pleased to learn that Endless Horizons has opened another class of giant-scale racing—for big biplanes. This is in addition to the Unlimited, Formula One and AT-6 classes already flown at Madera, CA, each year. The new sport-biplane class, which will race at Madera '95 (September 28 to October 1), includes these parameters: a minimum combined upper and lower wing area of 1,460 square inches; a root and tip thickness that's 12 percent of the root and tip chord; and a maximum engine displacement of 4.6ci (any fuel can be used that doesn't include nitrous oxide or hydrazine). No tuned pipes of any kind are permitted, and maximum weight can't exceed 28 pounds (wet).

You can contact Madera Race Central for a complete list of biplanes that qualify, but here's a partial list of manufacturers who have kits or plans for planes that can be flown at Madera: Ace R/C* Weeks Special, Byron Originals* Christen Eagle and Pitts, Eagle Aviation* Christen Eagle, Precision Aviation* Ultimate, Wendell Hostetler* Bucker Jungmeister (plans), Lanier RC* Ultimate Bipe, Ohio R/C* Ultimate Bipe, Horn-Dog Aircraft* Christen Eagle, KT Aviation* full-tilt Boogie and Miles Reid Ultimate Bipe (plans). For more information, call Race Central at (310) 320-8369.

Race circuit update: as we go to print, neither the Giant Scale Air Racing Association (GSARA) nor the United States Racing Association (USRA) has officially recognized a biplane class. The Galveston races, held in mid-July, now include Unlimited, AT-6, Formula One, Thompson Trophy and "Midwest*" AT-6 classes. For more information, call (800) 741-7058.

AT-6 races will be held at the national AMA flying site in Muncie, IN, on August 16 to 20; call (317) 287-1256. AT-6 races are held at the Aviation Expo in Ankeny, IA, in July; call (515) 964-2000. For more information, consider the Racer's Edge, a giant-scale-racing newsletter published six times a year by Rob Wood ($28.50). You can reach the Racer's Edge at 101-A Hickey Blvd., No. 501, South San Francisco, CA 94080; (415) 756-2214.

NEW LOW-SPEED AIRFOIL DATA

The remarkable new series of tests on model-size airfoils being conducted by Michael Selig and his graduate students at the University of Illinois in Urbana, IL, continues. An earlier series of tests at Princeton (SoarTech 8, by Selig, Donovan and Fraser) has heavily influenced the choice of sailplane airfoils used by competitors and manufacturers in recent years. The current test series looks at airfoils for all types of model applications (for background, see the editorial, "Help Advance the Art," in the July '94 issue of *Model Airplane News*).

During the first major test phase, more than 300 hours of wind-tunnel-test time was logged. Airfoil performance data was gathered on more than 30 airfoils for free-flight models, R/C sailplanes, sport planes and more.

Herk Stokely, publisher of SoarTech Publications, is making this data available in a new volume that is the first in a series. Titled "Summary of Low-Speed Airfoil Data, Volume 1," it includes 317 pages of narrative and data. Its price, including postage, is $25 in the U.S. Add $4 for international surface mail; for airmail to the western hemisphere, add $6; for airmail to Europe, add $13; and for other parts of the world, add $17. All the actual tabulated data and airfoil coordinates (but none of the narrative or illustrations) in the book will be available on disk as well. The price for the disk in the U.S. is $15, including postage (for disk orders outside the U.S., add $1).

Herk comments that a significant portion of the money generated by book and disk sales will be returned to the University of Illinois to provide part of the continuing support for Michael's ongoing test program. If you wish to order a copy of the book and/or the disk, send a check or money order in U.S. dollars to SoarTech Publications, 1504 N. Horseshoe Cir., Virginia Beach, VA 23451. You can also e-mail Herk at HERKSTOK@aol.com.

The test series is being funded in part by donations from individuals, clubs and organizations such as the AMA, the National Free Flight Society, the ISF-International R/C Soaring Forum and others. It's a worthy enterprise that needs your support; it can only result in better flying models. If you'd like to donate time (build a test wing section) or cash, or if you want additional information on the progress of the airfoil testing program, contact Jim Guglielmo, University of Illinois AAE Dept., 306 Talbot Lab, 104 S. Wright St., Urbana, IL 61801. Ask for program bulletin no.'s 1 and 2.

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.*

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AIRWAVES

WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News,** 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

FLAPLESS IN SEATTLE

I'm a beginner in scale modeling, and I have questions about installing flaps on my latest model—a Dynaflite P-51. How big should I make them, and how do I get more travel out of them than is normal for ailerons? I thought about installing them like "top-hinged" ailerons, but that really doesn't look great (large gap under the wing), and I'd get only about 25 degrees of deflection. Hope you can help.

BRAD JOHNSON
Seattle, WA

Brad, a Dynaflite with flaps would be a great flying airplane, and the flaps would enhance the fun-scale model's appearance. How large the flaps should be depends on the full-size aircraft. With the P-51, the flaps should start at the wing root and terminate at the inboard end of the aileron. Because you're building a fun-scale model, you can treat the flaps like another set of ailerons, but the hinge line has to run along the wing's bottom surface—not along the top! I've had great success with Robart Hinge Point hinges, and I use them on most of my models—scale and otherwise. Look at your plans and find the wing's cross-section. Trace this onto paper, and sketch out a new flap detail. Solid balsa or a built-up flap (built out of the cut-out section of the wing's trailing edge) can be used. Drill holes in the bottom edges of the flap's leading edge and the wing's new trailing edge, and install the hinge points according to Robart's instructions. With this setup, you should easily get 90 degrees of deflection or more. A simple aileron control horn and a bellcrank/pushrod linkage system can be used to tie both flaps to a single servo that's placed in the middle of the wing. For more information on flap construction, see my article on slotted flaps this issue. GY

BIRD-DOG DAYS

I entered the U.S. Army in 1957 and trained to fly both the L-19 and the L-20 (U-6) Beaver. I was delighted to see a ¼-scale replica of an L-19 in your June "Pilot Projects" (page 28). Over the years, I have looked for the models of these planes, but I haven't seen them in kit form (plastic scale *or* radio-controlled). How can I obtain the plans to build the model pictured in your magazine?

The flight school that I attended was in San Marcos, TX, where most of the flight instructors were civilian; most were ex-Air Force or Navy pilots. The Army used its own pilots as check pilots. Upon completion of this school, all pilots were sent to Fort Rucker, AL, for tactics and instrument training. A modified version of the L-19 was used. It had black curtains in the back seat where the student flew using instruments only. The L-19 also had a constant-speed McCauley/Hartzell propeller. Two engines were used: the Continental and the Lycoming 213hp.

I want to thank you in advance for any information that you may be able to supply regarding this superb model.

DANIEL W. FRY
New Columbia, PA

Daniel, we're glad you enjoyed Duke Aulenback's photo in our "Pilot Projects." He tells us that he built the model from Roy Vaillancourt plans, which you can order from Vailly Aviation, 18 Oakdale Ave., Farmingville, NY 11738; (516) 732-4715 after 7 p.m. EST. Vailly Aviation has many plans and accessories for giant-scale warbirds and other designs. Give them a call, and tell them that Model Airplane News sent you. DS

NET THANKS

Many, many thanks to the forward-thinking folks at Air Age for their support of the soaring-list server. This kind of support for the modeling hobby is why I continue my *Model Airplane News* subscription—oh, and that fine column, "Center on Lift." Whoever writes that is pretty good, too.

BOB KIDD
Compuserve address

You're welcome, Bob. Michael Lachowski discusses the Internet Mailing List R/C Soaring Exchange in his "Center on Lift" column this month. We're sure that you and other soaring enthusiasts will continue to benefit from the Internet list and from his column. Keep on gliding!
DS

LOOKING FOR PILOTS

One of my favorite sections of *Model Airplane News* is "Pilot Projects." I really enjoy looking at the models and reading their descriptions. I often wish that I could contact the pilots who sent in the photos. Do you keep records of their addresses and phone numbers?

PAUL BRYANT
New Milford, CT

Paul, you're not alone. I receive calls every week from modelers who would like to get in touch with the builders of the planes featured in "Pilot Projects." To maintain the modelers' privacy, I can't give out addresses and phone numbers, but I'd be more than happy to forward letters to them. Just write to the modeler c/o Model Airplane News, and be sure to mention which issue his or her plane appeared in. Don't forget to include an SASE! DS ■

ERRATA

In the July issue, an incorrect phone number was given in Top Gun Aircraft's ad. The correct number is (800) 380-JETS.

HOW TO Slip an Airplane

A safe, effective way to lose altitude on approach

by ROGER POST JR.

HAVE YOU ever, on final approach, found yourself flying too high or too fast? Have you had to cope with a strong crosswind or make a landing approach over an obstruction? Or have you been forced to land in a tight spot? Slipping can help us to overcome all of these situations and let us land our planes safely.

In the old days, full-scale pilots would slip their planes to make the approach angle steeper without gaining air speed. This was particularly helpful in emergency situations, short-field landings and landings over obstacles. With the invention of flaps, the art of slipping seems to have taken a back seat. If you visit a small airport, you might be lucky enough to see somebody flying a tail-dragger (without flaps) and doing slips on the approach. Seeing it done with a full-size aircraft will greatly enhance your ability to create a slip with your model.

TYPES OF SLIP

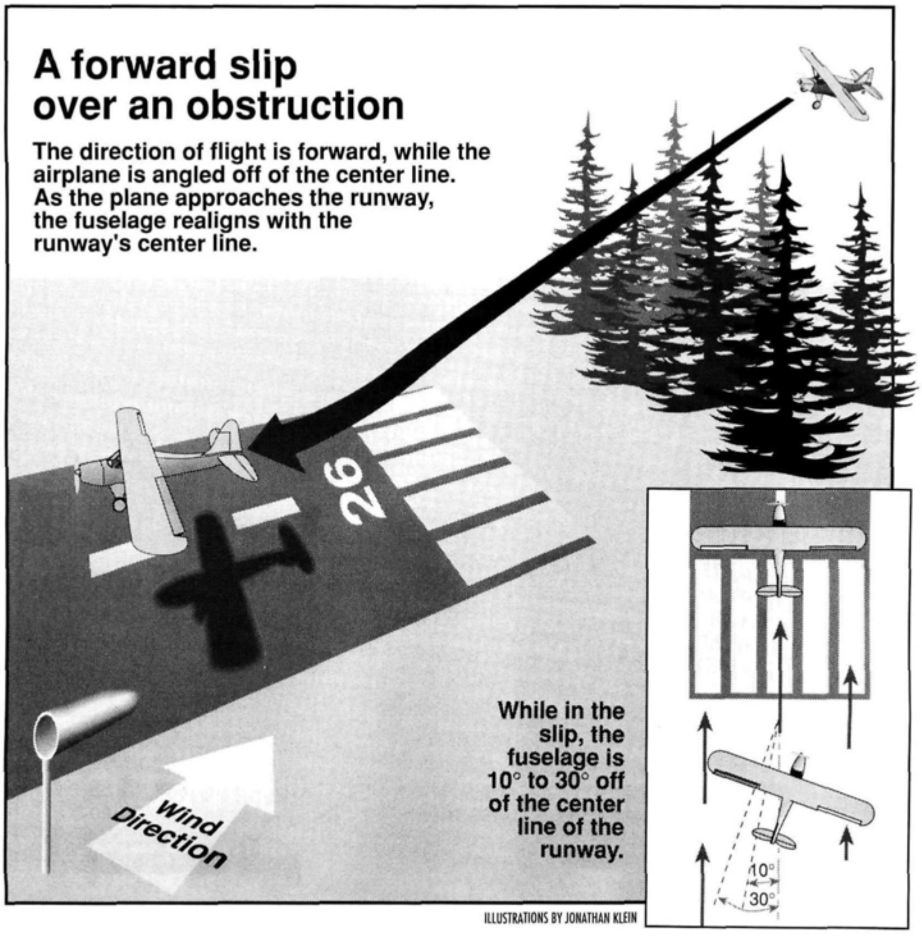
• **Forward slip.** This allows the pilot to lose altitude without increasing air speed because the plane's fuselage ends up in a position that's 10 to 30 degrees off the center line of the approach. This offset fuselage, which is now acting as a large speed brake against the relative wind, helps to slow the aircraft down. The offset fuselage is created by lowering one of the wingtips (with aileron input) into the crosswind or relative wind and adding a large amount of opposite rudder, e.g., left aileron plus right rudder. The plane is actually slipping in a forward direction of flight.

At this point, your rate of descent (feet per minute loss) can be controlled by the amount of aileron and rudder you use. If you need to lose a large amount of altitude in a short forward distance, you increase the aileron input and counteract the rolling tendency with more opposite rudder. A shallower descent (which can be used over a longer forward distance) requires less aileron and opposite rudder input.

Besides using the fuselage as an air brake to control air speed, you can also use the pitch attitude of the nose. If you raise the nose, it will slow the plane down; if you lower the nose, your air speed increases. Slips are usually done with the throttle at idle, but it's sometimes necessary to add throttle to gain back a little of the lost altitude.

Remember: power is altitude; pitch is air speed.

The flight path of a forward slip is straight down the center line of the runway, but the nose of the aircraft is off the center line. The wind, landing setup, pilot preference, etc., will determine whether the nose is to the right or left of the center line.



ILLUSTRATIONS BY JONATHAN KLEIN

• **Side slip.** This allows the aircraft's nose to remain on the heading while the plane slips sideways through a moving air mass. This is particularly useful in controlling the drift of an airplane. The drift is caused by strong crosswinds, and it will blow the plane off the center line of the runway. To keep on course, we must slip the plane with the ailerons and rudder, but our rudder input must be controlled so that the nose of the airplane stays parallel to the runway center line.

• **Knife-edge slip.** This is a variation on the side slip and can be used if you need to lose a lot of altitude and place the plane at the beginning of a runway that's bordered on both sides by tall trees. I had the opportunity to experience this in the back seat of an Aeronca Champion. What a ride that was! The side of the plane's fuselage was facing the ground, and we were falling in a knife-edge attitude. The nose was a little high, and the tail was a little low. The

direction of the slip was a straight line to the ground. This attitude requires quite a bit of aileron input to get the wing perpendicular to the ground and a large amount of opposite rudder input to help counteract the rolling tendencies. The descent is controlled by the throttle and, once you're close to the touchdown point, you add some power (to get air flowing over the tail surfaces), kick in opposite rudder (to level the fuselage), level your wings with rudder and then aileron input and land the plane. Nothing to it!

HOW TO SLIP YOUR PLANE

- First, consider the type of plane you have and how much throw you have on your control surfaces. Most planes will slip well if they have more than the recommended throw on their rudder and ailerons.
- Second, it helps to have a large vertical fin and rudder. Some planes will slip with a small rudder, but to really nail a forward slip, you'll need a large rudder with lots of deflection.
- Third, you must practice the slips with plenty of altitude to recover in case your thumbs get mixed up.

Forward Slip

Line up with the runway, and bank one of your wings down.

Here's the $64,000 question: *which wing should I bank?*

Assuming that you fly facing your runway and your runway is parallel to the flight line, you must first consider the wind direction. (I'll use compass headings to try to eliminate any confusion.) Your body faces north, and your runway runs east to west.

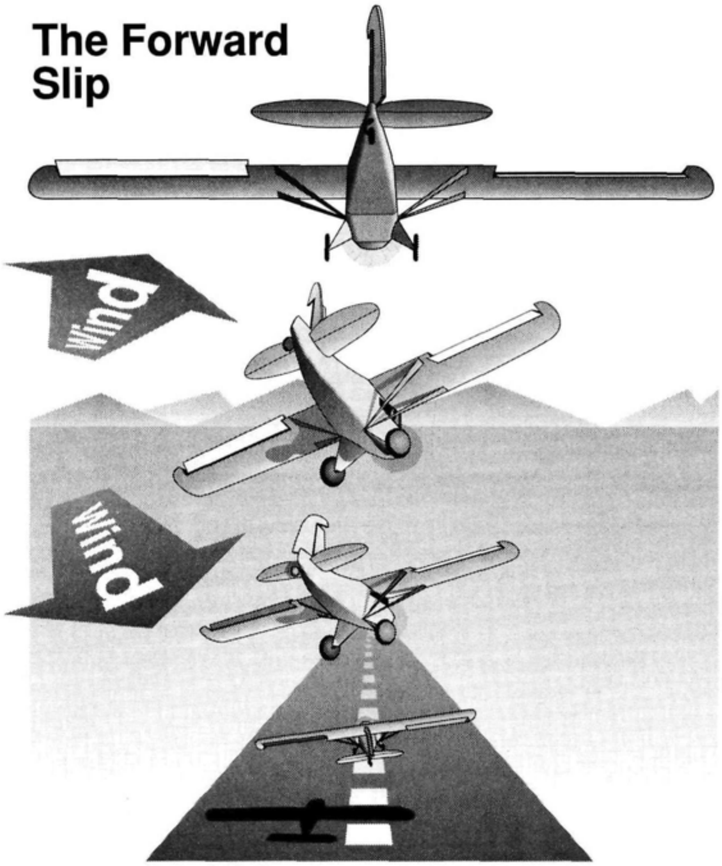
- *Wind is blowing from the northwest:* your plane approaches from the east with the right wing down.
- *Wind is from the northeast:* you approach from the west with the left wing down.
- *Wind is from the southeast:* you'll also approach from the west, but the right wing will be down.
- *Wind is from the southwest:* you'll approach from the east with the left wing down.

Rule of thumb: approach into the wind, and keep the plane's upwind wing lowered into the crosswind.

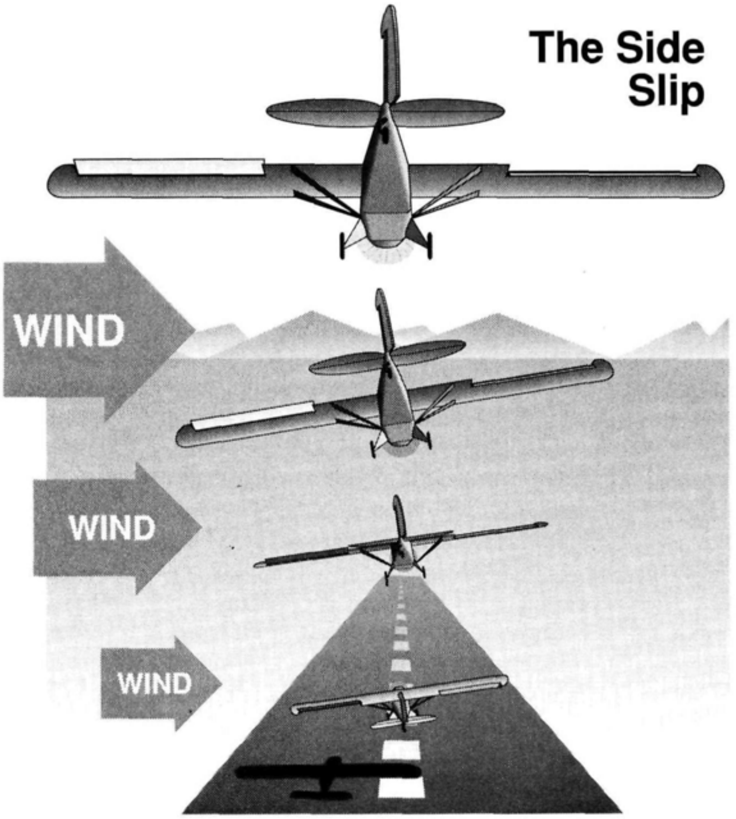
When there's little wind or it's blowing straight down the runway, the approach to landing direction can be the second consideration in determining which wing to bank. If your plane is right of the center line, you should bank the right wing down. If you approach from the left, the opposite applies. The position of obstructions in the flight path should also be considered when banking a wing for a slip. Finally, consider pilot preference; some of us are more comfortable banking a particular wing.

Having determined which wing to bank, we apply opposite rudder to counteract the rolling tendencies. The real trick to this cross-controlling is how much pressure you use on the sticks. You'll find that you're either spreading your thumbs or pushing them together. One of the sticks might have more input than the other, but this will change as the procedure moves further along. What changes it?: wind speed and direction; how much altitude you'd like to lose; having a short distance over the ground to lose a lot of altitude; the height of the obstructions; the speed of the approach; the size of the control surfaces and how much throw they have.

When the wind speed is high and its direction is angled far



Here is the forward slip from the rear view. Note that in the third airplane down, the rudder shows a deflection to the left. This starts to realign the fuselage with the runway.



During a side slip, the plane is actually slipping through the moving air mass sideways. Its ground track remains on the runway heading.

off the center line, you must lower the upwind wing more to prevent the plane from drifting off course. Your aileron stick will have a little more input than usual, and your rudder stick input will balance out the aileron deflection so that the plane performs a side slip. (The nose of the plane is still lined up with the runway.) If you need to lose a lot of altitude over a short forward distance, you can add in more aileron and counteract with enough opposite rudder to make the plane go into a forward slip.

Knife-Edge Slip

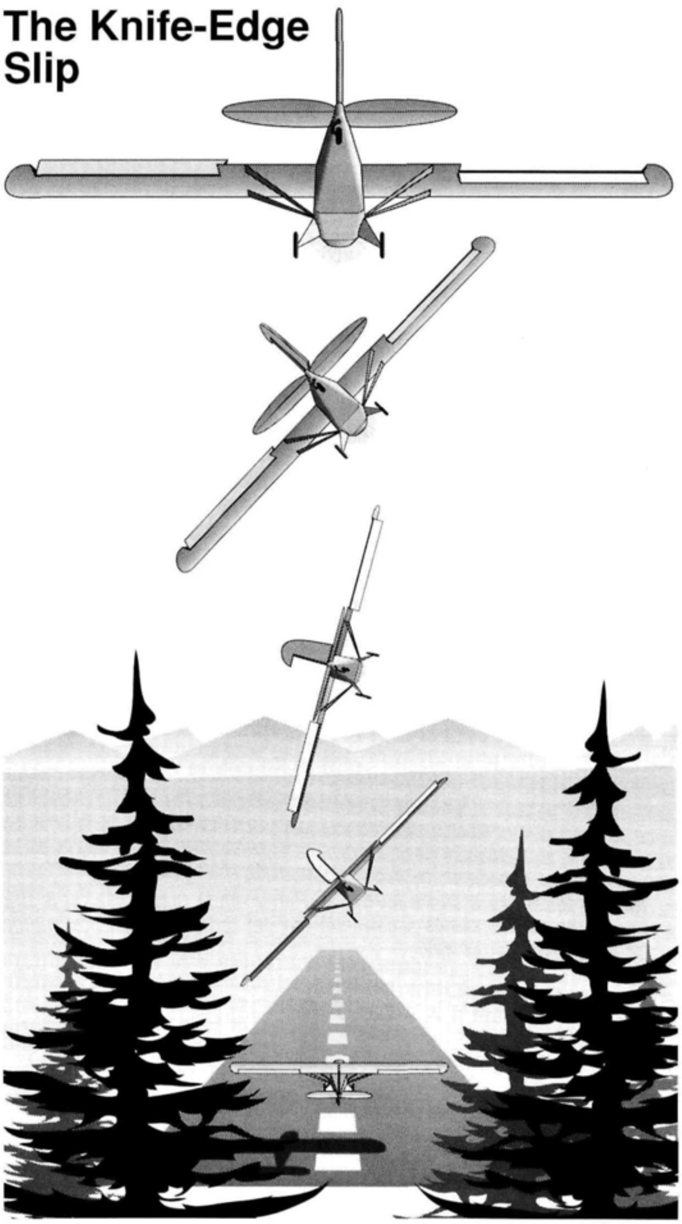
The knife-edge slip is a steeper version of the side slip. The wing is almost perpendicular to the ground, and the flight path is more of a straight line to the ground rather than forward or sideways. For this one, your sticks could be pushed in or spread out almost all of the way. You'll lose altitude very quickly with this one, so be ready to add throttle to control your rate of descent. Watching real airplanes do slips and practicing on your part to re-create what you see will help your thumbs to respond automatically.

Caution: don't put the plane into a cross-controlled slip and freeze your thumbs. As the slip progresses, you'll have to adjust the plane's attitude with small stick inputs. You may need more rudder or less aileron or vice versa, and you'll have to make these minute adjustments to keep the plane slipping over the intended ground track. This hand/eye coordination takes some time to perfect, so be patient, and practice it with plenty of recovery altitude.

In a forward slip, the plane's air speed will be greatly reduced by the exposed side of the fuselage. This is a handy feature to know in case you come in for a low pass and your engine quits. Just throw the plane into a forward slip, and you have an instant speed brake. If this is done properly, you can land on the runway and not overshoot it. If you lose too much altitude and look as though you will be landing short of the runway (engine still running), add power to gain the altitude back.

You may find yourself feeding in a little up-elevator through the entire slipping process. This is all right if you have sufficient air speed to prevent the plane from stalling. Remember that a forward slip will reduce your air speed and any up-elevator will further reduce the air speed because of the increased angle of attack. This could send you into a stall, maybe even a knife-edge stall, if your wing happens to be banked at a drastic angle. Don't be afraid of a lower-than-usual nose attitude when you practice your slips. If things get too complicated all at once, add power, straighten the fuselage with opposite rudder, level the wings with the ailerons and then go around and try again. A bad approach makes for an even worse landing.

The Knife-Edge Slip



The knife-edge slip is a more severe side slip and allows the plane to lose altitude at a faster rate than the other slips. It can also be used to land in between obstructions.

LANDING AFTER A SLIP

Now that you've worked out how to lose altitude and control air speed and are able to keep the ground track straight, you must straighten the plane out to land. To straighten out the fuselage (if you're in a forward slip), simply reverse the rudder input. Level the wings with the ailerons, and flare into a three-point landing. If there's a crosswind, keep the upwind wing lower with some aileron input, steer with the rudder and perform a wheel landing. Remember to gradually increase your aileron input into the crosswind as your rollout speed decreases. This will prevent your plane from flipping over after the landing has been completed. At the end of a side slip, you will not need to straighten anything out, but you will have to keep the upwind wing lower in the ground-effect phase of the landing and remember to increase your aileron into the wind during the rollout.

You will find that, with practice, your thumbs will get the feel of how to control the slip. You'll see that a forward slip will use more rudder than a side slip.

Two things to keep in mind:

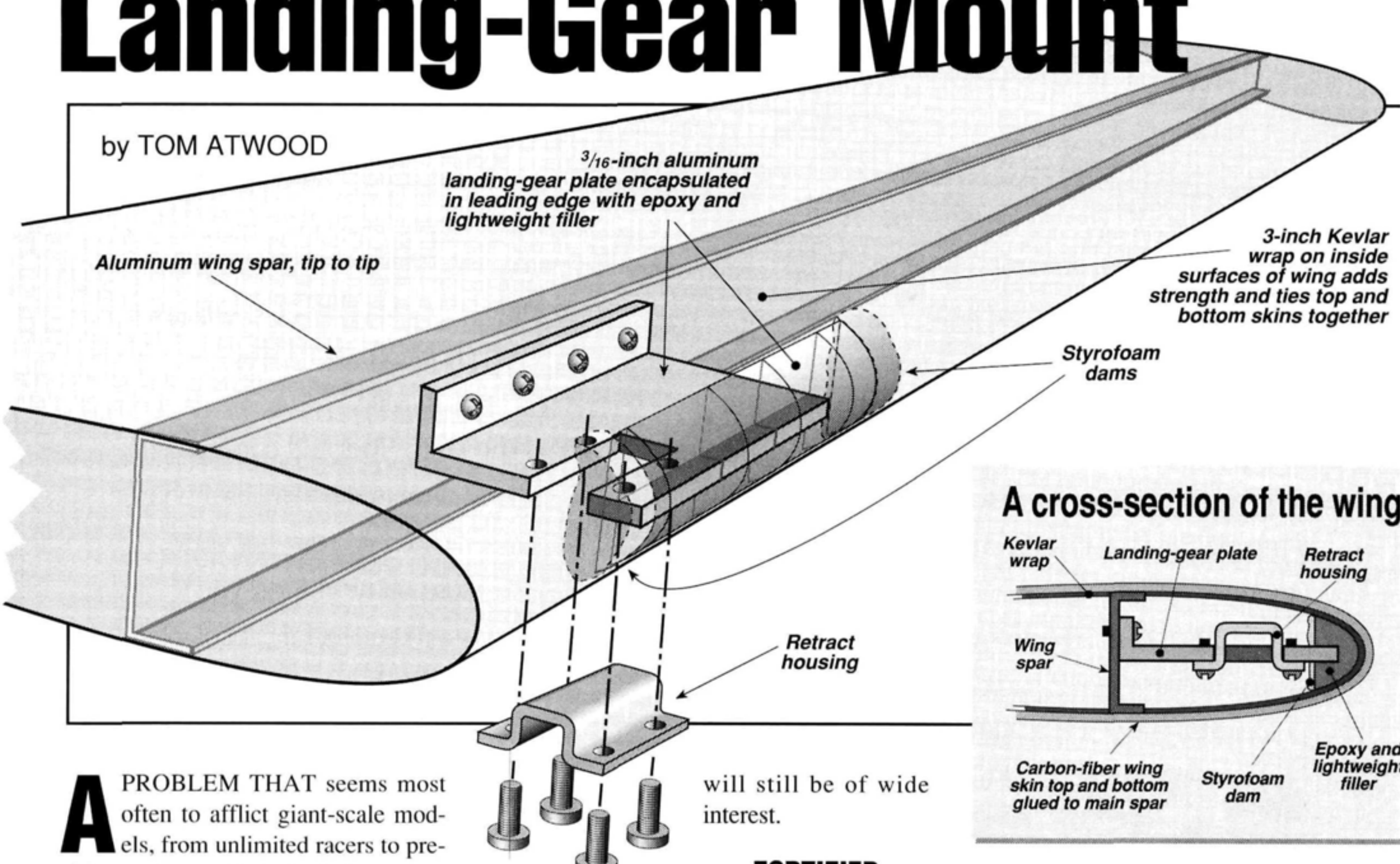
• The side slip's ground track will stay straight, but the plane will actually be slipping *sideways* through the moving air mass.

• In a forward slip, the plane is actually slipping *in a forward direction* relative to the runway.

I hope this helps you understand the slip a little more and, if you can, I highly recommend that you find a good taildragger pilot who'll take you up and show you how the real thing is done. Slipping a Piper Cub on an approach with the side doors and the window open is a great way to spend a summer day. Good luck, and practice with recovery altitude. ■

Giant-Scale Landing-Gear Mount Achilles' heel no more?

by TOM ATWOOD



A PROBLEM THAT seems most often to afflict giant-scale models, from unlimited racers to precision scale warbirds, is their propensity to have their gear ripped out during a rough landing. It doesn't happen frequently, but it happens often enough to warrant a close look at possible solutions. Wayne Siewert of Aerotech Models Inc.*, has come up with an innovative, simple solution. He uses this design on his KI-84 Frank (which he campaigned at Top Gun '95) and on his new P-51. Although many readers are not flying molded, hollow-shell wings, we believe that this gear-mount solution will still be of wide interest.

FORTIFIED FOUNDATION

A 3/16-inch landing-gear plate is riveted to an aluminum main spar. That plate has a bay in it to receive the retract housing. After the plate has been jigged into perfect alignment, its forward edge is encapsulated in the wing's leading edge in a slurry of lightweight filler and epoxy. Foam dams confine the filler/epoxy mixture to the inside of the leading edge along the front edge of the landing-gear plate.

The wings on Wayne's planes are of molded carbon fiber. Their inside surfaces are glued to the aluminum spar. Before he installs the gear-mount structure, Wayne also epoxies a 3-inch Kevlar wrap to the inside upper and lower surfaces of the wing skin. This further binds the top and bottom carbon-fiber wing surfaces together. Using this approach, Wayne has never had a gear set be ripped out in a rough landing.

Left: Wayne Siewert's KI-84 Frank comes in for another landing. Wayne's approach to landing-gear mounts for giant-scale aircraft is a giant step toward eliminating landing-gear failures. Right: this exact-scale, 84-inch-span, 21-pound P51-D kit also uses this new technology.

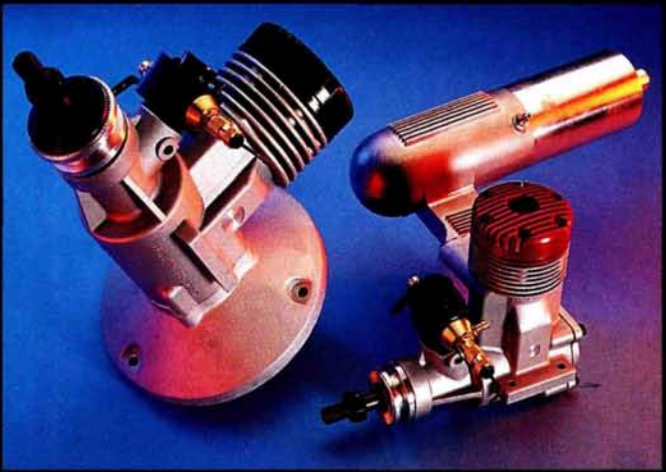
**Addresses are listed alphabetically in the Index of Manufacturers on page 138.*

AIR SCOOP

CHRIS CHIANELLI

New products or people behind the scenes; my sources have been put on alert to get the scoop! In this column, you'll find new things that will, at times, cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

A Closer Look



In the March "Air Scoop," I announced that Altech Marketing is now the exclusive distributor of the finely made line of Irvine engines. Having handled the legendary Enya line for more than 30 years, Altech has built an outstanding reputation in customer service and parts supply. They'll no doubt bring this high level of experience to the Irvine line.

Pictured here are two new Irvine engines that I find especially interesting. The new 1.50RC 2-stroke features a low-tension Dyke's ring and a radial mount for greater mounting versatility. Our very own Mike "The Professor" Billinton is currently in the laboratory testing the 1.50. As soon as he has finished, we'll reveal his empirical proclamations.

Also pictured is the new Redhead Q.72 ABC 2-stroke (the "Q" stands for quiet). Howard Crispin Jr., chairman of the AMA Sound Committee, recently tested the Q.72 and, with an APC 12x11 prop, it measured an impressive 87.5dB at 10,000rpm; with an APC 13x8 prop, it measured 84.5dB at 9,100 to 9,200rpm. These readings, all taken at 9 feet from the engine's right side, are excellent for an engine of this size at these rpm levels. Watch "Air Scoop" for more Irvine updates. For more information, contact Altech Marketing, P.O. Box 391, Edison, NJ 08818-0391; (908) 248-8738.

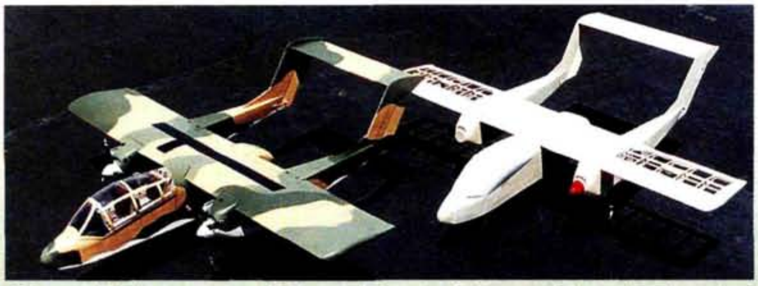
If you have a basic trainer or two under your belt and you're wondering, "What should I try next?" you should stop and take a look at this reasonably priced, colorful ARF from Global Hobby Distributors. The American Flyer is a .40-size, all-balsa, shoulder-wing, film-covered, intermediate trainer that sports a semi-symmetrical airfoil for aerobatic, yet docile performance. The American Flyer is 90 percent ready to fly and comes 100 percent finished in the bright scheme you see here. Specifications: wingspan—56 inches; wing area—575 square inches; recommended engine—.40 to .46 2-stroke; 4-channel radio required. The list price is $150. Contact Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.

The Patri-ARF .40

MIDWEST PREZ HELPS EAA YOUNG EAGLES

In their quest to introduce American youth to the exciting world of aviation, the EAA (Experimental Aircraft Association) is sponsoring the Young Eagles Flight Program. Their goal is to take one million youngsters aloft by the year 2003. The EAA is in contact with full-scale pilots all over the country who are willing to invest a little time to advance this worthwhile cause. Thus far, the program has flown 115,000 kids. Here, Midwest president Frank "DonFrancisco" Garcher (far left in red-white-and-blue jacket) flies these young enthusiasts (and dad!) in his full-scale Scheibe 2000 powered glider. From the left, they are: Matt Bryant—17 (seated); Kevin Cole—15; Henry Barrick—15; and Henry's dad, Bill Barrick.

If you're interested in helping out with the program or you want to get your kids into flying, contact Steve Buss at (414) 426-4831. Steve is in charge of the Young Eagles Program in Oshkosh, WI.



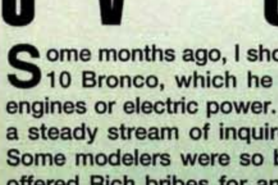
OV UPDATE

Some months ago, I showed you a photo of Rich Uravitch's new OV-10 Bronco, which he designed for twin .15 to .25 2-stroke glow engines or electric power. The response has been amazing; we've had a steady stream of inquires regarding the Bronco's publication date. Some modelers were so beside themselves over the design that they offered Rich bribes for an "advanced" set of plans. Sorry, guys; Rich isn't releasing anything till it's ready.

The reason for the delay? Rich, his lovely wife, Maribet, and their faithful Airedale, Tedder, have headed for the Florida sun. Rich has informed me, however, that all the tooling for the plastic parts is complete, and the construction article will soon be ready for publication. For those of you who wish to contact Rich, his new address is 1094 Glendale Ave. NW, Palm Bay, FL 32907; phone/fax (407) 728-0486. Rich assures me that things will be back on track by the time you read this, and he will again crank out some exciting designs.

JR Extra Premium Packs

JR's philosophy is the same as many modelers': when you've invested $1,000 or more in a model, why not give it the extra protection that's provided by a first-class flight pack? JR has gone the extra mile by cutting no corners in the design of its Extra Pack line. For the greatest possible capacity for their size and weight, all Extra Premium Packs use Sanyo cells of the highest quality. To ensure reliability, every pack is quadruple-welded (not soldered). Heavy-gauge wire is used to reduce resistance, and every pack has gold-plated pin JR connectors. The packs are available in 600, 800, 1100, 1400, 1800 and 2800mAh capacities in 4-cell and 5-cell configurations for radios—such as JR's—that are rated for both 4.8V and 6V operation. Contact Horizon Hobby Distributors Inc., 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511; fax (217) 355-8734.



RED DOG 35

For only $189.99, the new 2.14ci Red Dog 35 comes with solid-state ignition and a very quiet, 92dB muffler. The American-made Red Dog isn't just a converted weed-smacker motor; it has high-quality features such as a ball-bearing crankshaft, a roller-bearing connecting rod and a Walbro pumper carburetor; there's also a one-year warranty. The options available include a spring starter, a prop extension and right- or left-hand rotation, which is great for twins. The 4.4-pound engine (including muffler) puts out 2.7hp and should be used with 18x8, 18x6-10 and 20x6 props. All parts are replaceable. For more information, contact Barn Speed Hobbies, 109 Center St., Lee, MA 01238; (413) 243-2651.

Ultimate Fun

I've never been a big fan of fun-fly planes, mainly because of the way most of the designs look (a lot like a straw glued to a Hershey bar; but that's just *my* opinion). When I saw this prototype of Sig's new Ultimate Fun Fly bipe designed by Mike Pratt (held here by Barb Pratt), however, I became a convert. Designed around a .32 to .46 2-stroke or a .40 to .50 4-stroke, the Ultimate Fun Fly features laser-cut wooden parts, removable wings, vacuum-formed wheel pants and formed-aluminum landing gear. It has a wing loading of 11.5 ounces per square foot when it's covered with Sig's Supercoat. Mike says that it does things none of his other fun-fly designs will do. I think this is going to be a very popular design. It will be available in early '96.

CONSTRUCTION

WHAT IS A GIANT PEASHOOTER? *Funny you should ask. In the spring of 1987, I designed a low-wing, sport-flying model that was very easy to build and is the best flying model I've ever flown. When it was time to finish the model, I looked at a picture hanging on my shop wall and decided, yes, that's how I will finish the new design. The colorful picture was of a Boeing P-26A called the Peashooter, so that's what I dubbed my new creation.*

Author (left) and R/C buddy Norm Strout with their giant Peashooters.

The August, 1987, issue of Model Airplane News featured a construction article on my model, which later became a Coverite kit. I've seen many that were built and painted to look like various other aircraft. You can let your imagination run wild and use a paint scheme from any one of the in-line-engine, "golden age" racers such as the Folkerts, Firecracker and Howard Ike.*

A sport flier that's right on target!

by HENRY HAFFKE

GIANT-SCALE PEASHOOTER

Author and son Raymond Haffke fire up the Peashooter.

BLUEPRINT FOR SUCCESS

The model flew so well that I wanted one on a larger scale for IMAA events. I had a friend in the blueprint business enlarge the design photographically so that I'd be able to construct an 82-inch-span version, using a Webra* .91. I thought this would be a super combination and time has proven me right.

Norm Strout—a good modeler friend of mine—wanted to build his first big model, so we decided to build a pair together. I would cut and prepare all of the parts and sub-assemblies for the two models, and because he had more spare time than I, he would do most of the building. We also agreed that we would finish them identically using the original Peashooter color scheme that gave rise to my Giant Peashooter!

We started the project early in the fall of 1993, and by late fall, the two models had been basically framed up. Winter came, and Norman headed to Florida for the season. He left my model with me so that I could work on it when I had time. When Norman re-turned in the spring, my model was ready to cover; I finished it by the first week in June and exhibited it at the MARCS show in Baltimore where it took second place. It was August before I got a chance to test-fly the model, because I had to get a new (legal) receiver for my Silver Seven radio, and I needed a muffler that would fit the new design.

SPECIFICATIONS

Type: IMAA-legal sport plane
Wingspan: 82 in.
Wing chord: 15.25 in.
Wing area: 1250.5 sq. in.
Length: 64 in.
Weight: 11 lb. (176 oz.)
Wing loading: 20.28 oz./sq. ft.
Power required: .90 2-stroke or 1.20 4-stroke
No. of channels req'd.: 4 (ailerons, elevator, rudder, motor)

CONSTRUCTION

Editor's note: a detailed set of instructions is supplied with the plans when they are ordered.

Construction of the "Big Pea" is so straightforward that I won't get into a blow-by-blow account here, but I'll touch on a few points. Cut the basic sides out of 3⁄16-inch-thick balsa. The outline of the sides is shown by little arrows on the plans. Because of the model's size, you'll have to glue two widths of balsa sheet material together to obtain the required fuselage height (5¼ inches).

When you start fuse construction, it's important to keep everything square. Lay one fuselage side on your work area and epoxy the firewall into place after drilling all of the holes you'll need to mount your engine and for the throttle rod and fuel lines. Use a square to make sure the firewall stays perfectly straight while the epoxy sets. Next, add formers F2 and F3 (they're identical), using the square to keep them straight. When this has set up, the rest of the fuselage construction is a breeze (use the square to keep things "honest").

TAIL SURFACES

Here again, you'll have to glue sheet material together to obtain the required widths of the tail surface parts. Cut the parts out of ¼-inch-thick sheet material, and join the elevators with a length of ¼-inch-square spruce or another hard wood. Do *not* cut lightening holes as shown in some of the construction photos. These weaken the surfaces and also contribute to nose-heaviness. Leave all the surfaces solid sheet material.

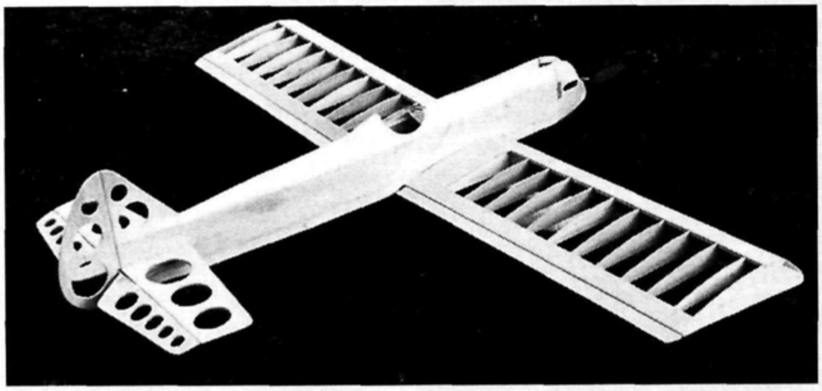
Before you close the rear of the fuselage top and bottom, it's a good idea to install the radio system according to the plans. There's room for as much equipment as you want to use. My prototype uses an Ace R/C* Silver Seven outfit with Atlas servos mounted on an ⅛-inch-ply servo board. After you've installed the radio and connected the pushrods from the servos to the tail surfaces, you can complete the fuselage. Both the top and bottom of the fuselage are sheeted with ⅛-inch balsa; on the bottom, the grain of this balsa runs perpendicular to the fuselage thrust line.

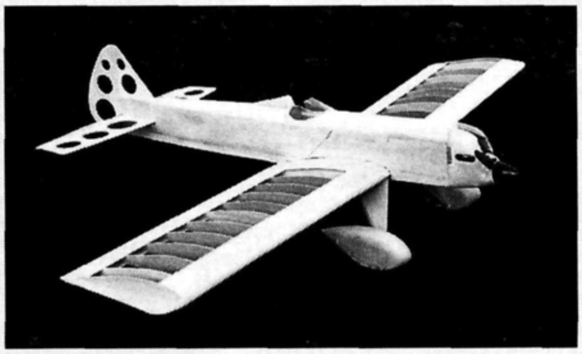
WING

The wing is very easy to build and goes together quickly. To form the leading and trailing edges and spars, I spliced short lengths of stock. Stagger the joints so they aren't all on the same line. If you buy longer material, you won't have to make joints. My prototype was made of 36-inch lengths of material that were spliced to the required lengths.

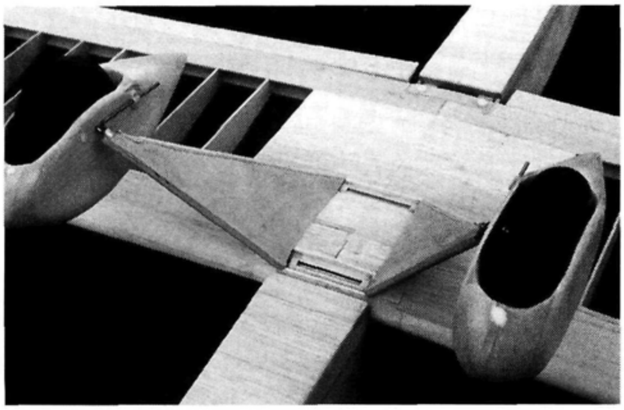
LANDING GEAR

Bend the two landing-gear legs as shown in the plans. With gear straps and screws, install the legs in the wing landing-gear blocks. Bind the legs together with copper wire, and solder them together as shown. Make the leg fairings by fitting a 3⁄16-inch-thick triangle inside the gear wires and sandwiching it between two 1⁄16-inch-thick ply sheets. Fit a 3⁄16x⅜-inch balsa strip on the outside of each leg, between the ply-

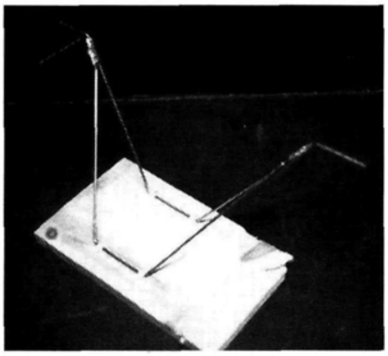




Completed model ready for covering.



Completed landing gear mounted on the wing; the wing has been bolted to the fuselage.



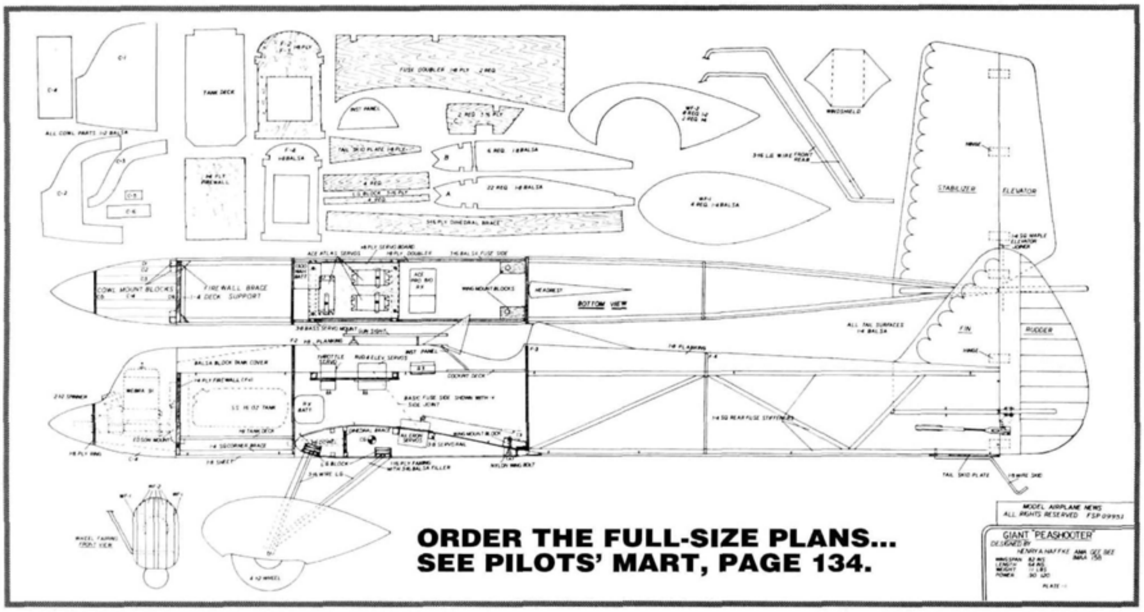
These landing-gear wires are held in a jig, ready for soldering. Here, soldering has been completed.

wood sheets. When the glue has dried completely, carve and sand the fairings to a streamlined shape.

The plans show patterns for making balsa wheel fairings. Cut the parts from the specified material, and laminate the layers together as shown in the front view of the fairings. Carve and sand to final shape. Fiberglass wheel pants are available from Precision Fiberglass*. Their Citabria wheel pants fit this model perfectly and are identical to the ones shown on the plans except for a small flat angle at the rear of the fairing.

ENGINE COWL

You can make a balsa cowl by following the patterns on the plans. Laminate the balsa parts together and cut out the inside of the cowl to fit your engine. Mount the cowl and glue a $2\frac{1}{2}$-inch-ply ring to the front of the cowl so that the prop shaft is exactly in the center of the ring. Mount the spinner and then carve and sand the cowl to shape. Fiberglass cowls are available from Precision Fiberglass.



COVERING

To prepare the model for covering, remove all removable parts i.e., the engine, radio gear and control surfaces. Give all of the parts a final sanding with fine sandpaper; this is the secret to a beautiful model. Any flaws in its structure will show through the covering so make sure

FLIGHT PERFORMANCE

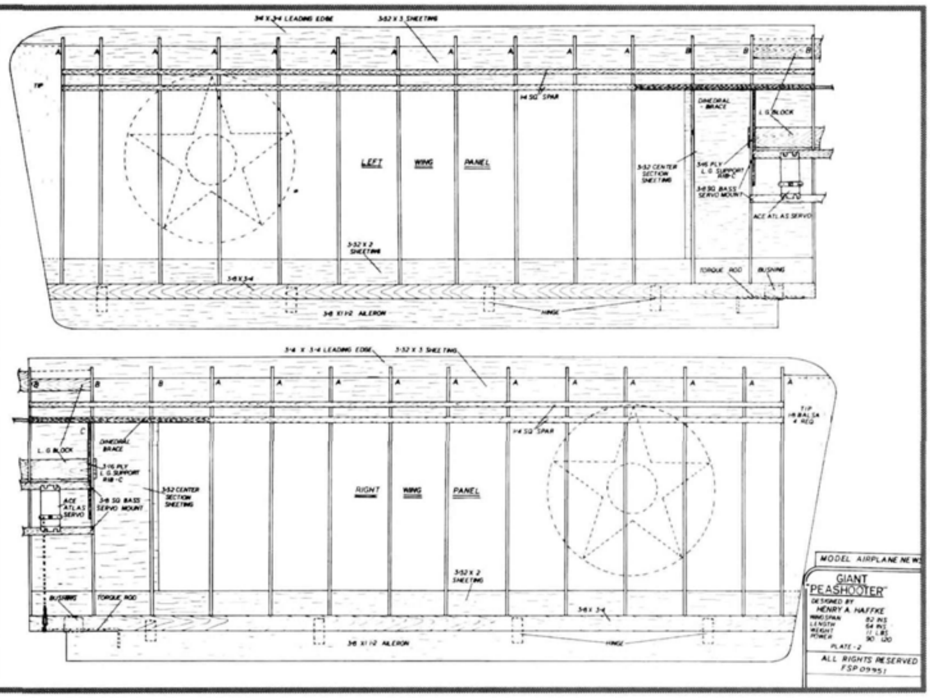
The Giant Peashooter was designed as a low-wing trainer—a role it fills very well. The model flies very gently, but it can be made to perform more sprightly by leaving the wing leading edge sharp, rather than sanding it blunt. The first flight was exactly as I had expected, except that aerobatic maneuvers were sluggish owing to insufficient elevator and aileron movement. I made three flights with no adjustments to the controls, and the plane was a delight to fly. A week later, after I had changed the linkage to give more elevator and aileron movement, I flew again.

More than two years ago, my local newspaper editor asked me to let him know when I was going to fly a new model. So I let him know about The Giant Peashooter and he met me at the local polo field; I think he was more excited than I was! I had told him that this was an enlarged version of a very successful design, and that I was quite confident that it would fly very predictably. He was really impressed when the model lifted majestically from the ground and flew beautifully. I made three flights and flew a large part of each at about $\frac{1}{4}$ throttle, 10 to 15 feet off the ground so that pictures could be taken.

• Takeoff and landing

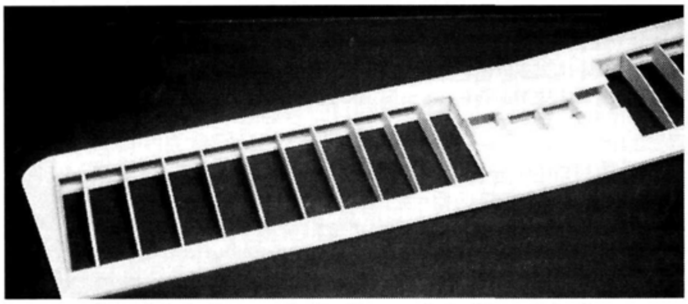
This model, powered by a Webra .91 and swinging a Rev-Up* 16x4½ pitch prop, is a very gentle flying bird. It took off from grass and needed very little rudder to stay straight on the takeoff roll. Later flights from a paved runway weren't much different. Climb-out is normal. Landing is predictable after a very shallow approach at idle throttle. When the model is close to the ground, just a slight touch of up-elevator holds it at a constant height as it bleeds off airspeed and gently settles to the ground. I'm sure that with the proper trim setting, the model could be landed

there are no flaws—the smoother, the better. Small dings can be filled with spackling compound and then sanded. When you're satisfied that your plane's structure is as smooth as possible, you can begin covering.

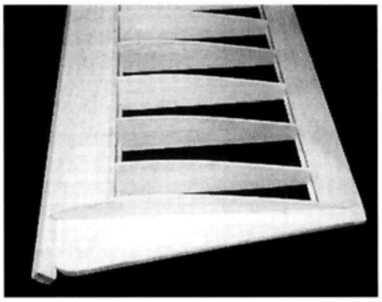


Both Norman's model and mine are finished with Coverite's new 21st Century fabric. This pre-finished fabric material gives a beautiful, durable, scale-like finish. We used light blue on the fuselage, Cub yellow on the wings and white on the tail surfaces. We also did all of the trim with this material: red and white on the fuselage, red on the tail surfaces and red and blue on the rudder. To make the red, white and blue stars on the wings, start with a blue circle, then add a white star and, finally, a small red circle ironed on top. The black "U. S. Army" lettering on the bottom of the wing is also made of this material. We painted the cowl, tank-hatch block and wheel fairings with 21st Century spray paint, which matches the fabric colors perfectly. We cut the red and white trim on the painted parts out of Coverite's Graphics Trim sheet material. The Thunderbird fuselage scheme and fin numbers were also made out of this blank trim sheet material.

At this point, all that's needed to finish the model are the windshield and a pilot. If you want to follow through with the Peashooter theme, you can add the gunsight, which is made out of dowels and then painted black. My pilot is the famous Coverite Black Baron (a giant one, of course), complete with white scarf and peashooter.



Completed wing panel after the panels had been joined.



Wingtip assembly.

DELAYS! DELAYS!

I was anxious to fly this new bird, but several problems delayed the testing. My radio hadn't been used for a few years, and I had to buy a new narrow-band receiver for it. Also, I didn't have a suitable muffler

completely hands-off. I've built only one model larger than this one—a 90-inch span—and when properly trimmed, it lands and takes off hands-off.

The Giant Peashooter feels a lot like my larger 15-pound scale model that has the same powerplant. On the ground, the model taxies very nicely, even though it has a fixed skid. Taxiing on paved surfaces is no problem, although a steerable tail wheel would make it even better.

• Aerobatics

The Giant Peashooter wasn't designed to be an aerobatic model, but it will easily execute almost any common maneuver. On the first flight after slow flight, I throttled up and gained some altitude before attempting any aerobatics. I made a sloppy attempt at a loop and then at a roll, which was slow with some altitude loss. Finally, I tried inverted flight and again lost altitude with full down-elevator.

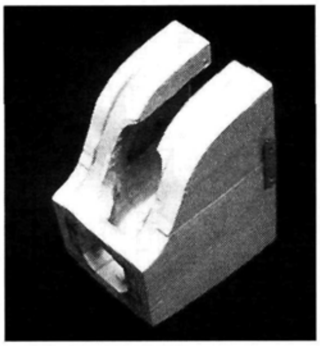
I tried these maneuvers again with a shallow-dive entry, and they were speedier and significantly improved. After I increased aileron and elevator throws (I had very little on the first flights), the maneuvers became much better and didn't need higher speed on entry. I'm sure that when I have time to move the CG back a little more, aerobatic performance will be considerably better. The model was a little nose-heavy and didn't have enough elevator or aileron throw to maneuver easily. So, to increase aerobatic performance, just change the pushrod attachments on the control horn or servo output arm. The Giant Peashooter's capabilities are limited only by pilot skill and control-surface deflections.

• High-speed performance

At full throttle, this clean aircraft moves right along. It's very stable and positive on the controls. It doesn't need trim changes when transitioning between high- and low-speed flight.

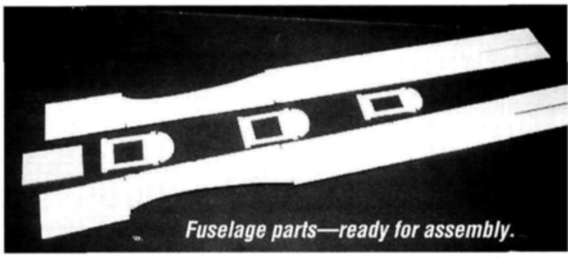
• Low-speed performance

In this regard, the Giant Peashooter is in a class by itself. After takeoff, I throttled down to less than 1/4 power and flew the model around the field for 7 or 8 minutes at between 5 and 20 feet of altitude, making fairly sharp turns around the newspaper editor while he did his thing with his camera. I flew two subsequent flights mostly at low throttle; it's enjoyable to see a model of this size fly so slow and close, with the pilot's silk scarf flapping in the breeze.

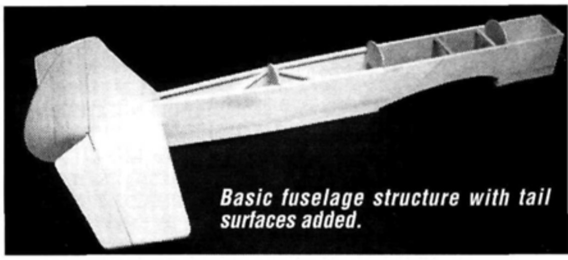


Cowl blocks glued up and ready for shaping.

Close-up of front end.



Fuselage parts—ready for assembly.



Basic fuselage structure with tail surfaces added.

because all of my previous models had radial cowls and required a Pitts-type muffler. Up here in the mountains of Vermont, such things are not readily available. The nearest hobby shop is over 30 miles away, and I've even had trouble getting a tube of glue there. I attended the MARC Show near Baltimore the week after I finished the model and thought I could get the things that I needed on that trip. As it turned out, I had to place a special order, and it was a few more weeks before I received them....Finally! Everything went together, and the model was ready for testing.

CONCLUSION

This is a very easy model to fly, and it will pretty much do anything you want it to; it has no quirks. Just make sure your controls are moving in the right direction before you fly it for the first time, and you should have absolutely no trouble. It's a taildragger, but don't let that bother you; it handles well on the ground. If you want to install tricycle gear, all you have to do i reverse the landing gear in the gear block and install a nose gear. If you're lookin for a simple-to-build, easy-to-fly, scale looking big bird, I think you'll be happ with this one. Others, including *Mode Airplane News* editor Gerry Yarrish, hav flown it and were very impressed.

** Addresses are listed alphabetically in the Index o Manufacturers on page 138.*

Norman Strout passed away on February 12, 1995, at the age of 73. He was an excellent modeler and had been involved with the hobby for many years. Although he had built several big sailplanes, the Giant Peashooter was his first, giant-scale powered model. In recent years after his retirement, he and his wife spent the winter months in Florida, and they attended the Sun and Fun Fly-In and Air Show before returning to Vermont. His AMA number was 575 and he was a member of the EAA. With me, he attended a couple of events involving the Granville family, and got to know all of the Granville people, whom he really liked. He attended the rollout of the Gee Bee R-1 replica at the New England Air Museum in Connecticut, two years ago and the Concord, NH, Air Show and Granville Family Reunion last June. This article is dedicated to Norm and his wife.

Commonsense Control

Worry-free radio installations for giant-scale aircraft

by FRANK PONTERI

This 75-inch-span, 17-pound Fokker D-VII from Aeroplane Works is powered by a Zenoah G-38 gas engine. Proper radio installation is a must for big birds.*

OVER THE past few years, I've written a number of "Field & Bench" reviews, and I always included a brief description of the radio installation. Here, I detail a typical radio installation in a giant-scale aircraft. My methods may not be the only good ways to install a radio in a giant-scale aircraft, but they've worked well for me over the years. I can't remember the last time I crashed a model because of radio failure. The most common cause of *my* crashes is poor brain/fingers communication!

CHOOSE THE RIGHT RADIO

Like most of you, I have a favorite radio brand; mine is JR*. Most of the radios on the market are reliable and will work well in your big bird, but JR radios have all the features I find important.

One major deciding factor for me is that JR offers a choice of servos when you buy a new system. I prefer high-torque servos in place of the standard servos. JR also offers helicopter versions of their X-347 and X-388 systems; the transmitters and receivers are the same as the aircraft systems, but a fifth servo is standard, and the 500mAh battery pack is replaced by a 1000mAh pack. In the heli systems, there are no servo trays, and this offsets some of the cost of the extra servo and larger battery.

Buy a computer radio with a minimum of six channels, even if you intend to use it in a 4-channel aircraft. You'll then be able to build a model with retracts and flaps without having to buy another radio for it; and your system will have all the options you need—servo-travel adjustment, mixing, sub-trims and a lot more.

Computer radios make aircraft setup a snap, and many of today's computer radios will store information on several aircraft. I now fly with a JR X-347, which has seven channels and stores information on four aircraft, and the 8-channel JR X-388S, which stores information on eight aircraft. JR's new 6-channel computer system—the XF622—can store information on two aircraft, contains all the bells and whistles and costs less than $300.

CHOOSING THE RIGHT SERVO

Servos come in a variety of sizes and with power outputs that range from 29 to 140 oz.-in. The International Miniature Aircraft Association (IMAA) recommends a *minimum* servo power of 48 oz.-in. for all flying surfaces. Servo choice depends on:

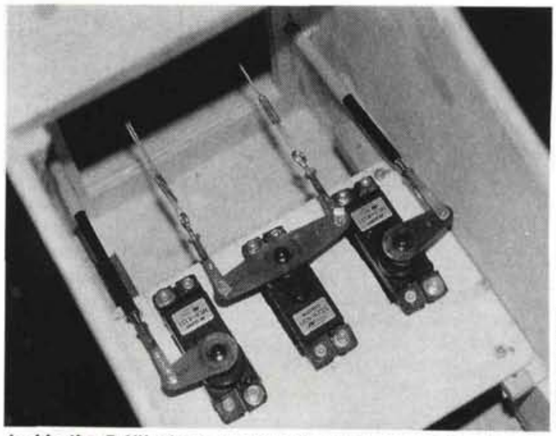
- the job it will be required to do—elevator, flap, etc.;
- the aircraft's weight and speed;
- the type of maneuvers the model will perform.

Most of my aircraft have one servo for each control surface: two for ailerons; two for the elevators; one for rudder; and one for throttle (a total of six). I use:

- JR 4131 90 oz.-in. servos—aileron and elevator;
- one JR 605 ¼-scale 139 oz.-in. servo—rudder. If you intend to fly a lot of knife-edge maneuvers, a larger rudder servo is recommended.

If, as in some scale aircraft, I'm unable to use two elevator servos, I use a single ¼-scale servo. I use one servo for each control surface to ensure that, if a servo or pushrod fails, I have a chance of getting the aircraft back in one piece.

For flaps, I've used a variety of servos. The flaps on my Byron Husky are driven by two, JR 517, standard servos. This aircraft lands at about 5mph so the flaps are subjected to relatively little air pressure. On my Ziroli AT-6, I use three, 60 oz.-in. servos for flap control (one for each flap section), and my Byron AT-6 has one, JR 605, ¼-scale servo to move all three flap sections. When choosing a flap servo, the



PHOTOS BY FRANK PONTERI

Inside the D-VII, there are two 90-ounce servos for elevator and a single 90-ounce servo for rudder (in the middle) set up for pull/pull control. Notice Du-Bro's heavy-duty servo arms.

object is to use one that will have enough power not to be overridden by air pressure when the flaps are extended. I use standard, JR 517, 40 oz.-in. servos for all other controls, such as throttle, smoke, and pneumatic retracts.

BATTERIES

It seems that at least two articles on batteries appear annually in model magazines, so I'll keep this short and tell you what works for me. I power my electronic ignitions with that little 500mAh battery that comes with the radio. Most of my aircraft contain at least six servos, so I use a battery of at least 1400mAh for radio power.

Some of my aircraft use 2500mAh battery packs. Many giant-scale aircraft require a bit of ballast in the nose for balance; I'd rather carry additional milliamps (larger battery) than lead for ballast. I'm now replacing all of my 4.8V flight packs with JR 5-cell, 6V packs. These packs are available in 1400, 1800 and 2800mAh. Almost all of the newer JR radios can be used with 6V packs, and the additional voltage results in faster servo response.

One final comment on batteries. Over the years, I've seen countless aircraft destroyed because of "radio failure," which, in many cases, was caused by a loss of power to the transmitter or receiver. Some of the causes of this are:

- failure to charge the batteries;
- battery packs were too old to hold a charge;
- homemade packs were poorly assembled;
- packs were improperly installed in the aircraft.

Most giant-scale aircraft require an investment of at least $1,000, and the average cost of a 1200mAh battery pack is $50. If you aren't confident about the condition of your batteries, put them in the trash—before you have to put your model in the trash.

PLANNING

"I just have to install the radio, and it will be ready to fly." How may times have you heard this—or said it yourself? When we built 40-size box-style aircraft, it was OK to finish the model and then install the radio, but when we graduate to big birds, this does *not* work. Radio installation should begin when we open the kit box and review the plans.

We must decide on the best places for the servos and the battery pack so that we can balance our models without adding a lot of ballast. A warbird such as the AT-6 has a short nose moment; its engine is mounted close to the CG, which is a long way from the tail. In a case like this, we should mount the radio equipment as far forward as possible. Knowing this, we have to plan access to the servos and radio and install our servo mounts when we construct our models. The routing of the pushrods will also have to be considered, as will the necessary pushrod braces. Don't mount servos in such a way that they can't be removed without cutting open the aircraft. To increase the life of your aircraft, inspect the servos and pushrods from time to time. Planning is vital!

Over the years, I've seen countless aircraft destroyed because of "radio failure," which, in many cases, was caused by a loss of power to the transmitter or receiver.

INSTALLING SERVO RAILS AND TRAYS

When you've determined where the various radio components should go, you must build into the airframe the rails that will hold the equipment trays. The objective is to eliminate any chance of the rails coming loose from the airframe.

My method:

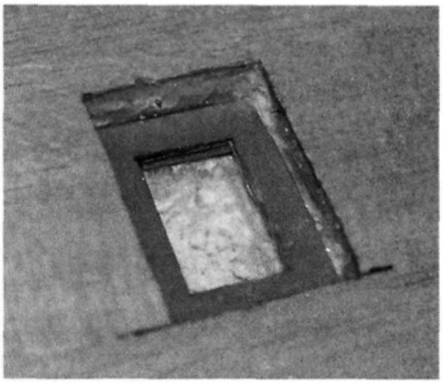
- Firmly secure a 3/8x1/2-inch hardwood rail to each side of the fuselage.
- If the fuselage is fiberglass, epoxy the rails to it, and then glass over them with 6-ounce glass cloth.
- Cut a mounting board out of 1/8-inch-thick aircraft plywood.
- Mount components such as servos and the receiver on the mounting board.
- Secure the mounting board to the rails with 1/2-inch cap-head screws (Figures 2 and 3). If you're installing only servos, you can substitute two servo rails for the mounting board. Epoxy the servo rails to the previously installed hardwood side rails (Figure 4). *Never ever* just butt-glue the servo rails to the fuselage sides (Figure 5).

Use a similar method to install the aileron and flap servos in a built-up wing:

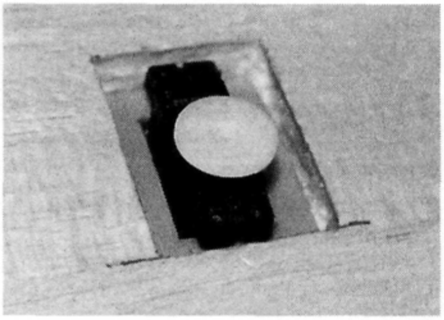
- Epoxy 1/4x1/4-inch spruce rails to the wing ribs.
- Epoxy or screw the servo plate to the rails.

Alternate method:

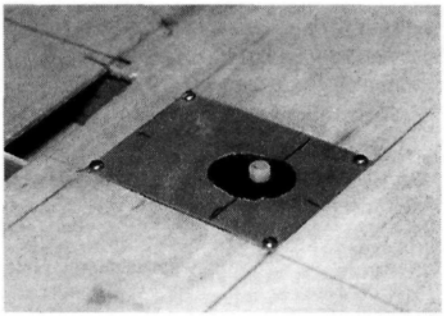
- Cut a hole in each rib, and run 1/2-inch-square rails between the ribs. If you use this method, it's advisable to laminate a



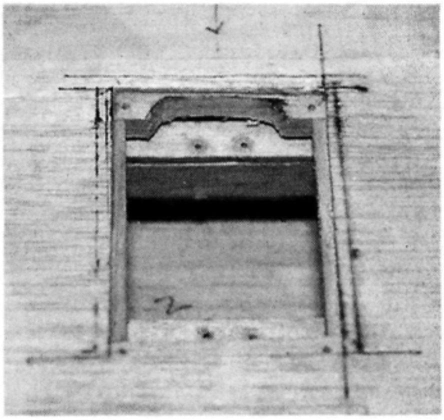
The servo plate is being fitted in a foam wing-core. Before you sheet the wing, don't forget to cut a channel in the core for the servo wires.



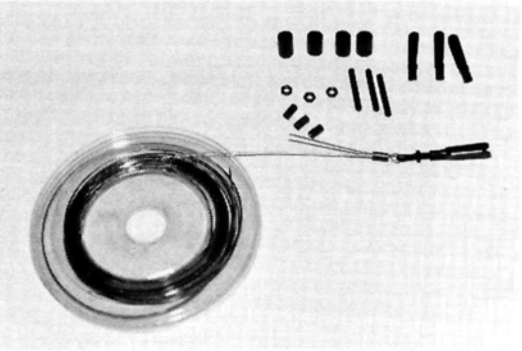
The servo installed in a foam wing-core. A 1/16-inch-thick plywood servo cover will complete the installation.



The completed servo installation in a built-up wing. The servo cover is held in place with four no. 2x1/4-inch screws.



Servo rails installed in a built-up wing. The rails are installed between the ribs with 1/16-inch lite-ply rib doublers in the area of the rails. Note the 1/4-inch-square spruce frame that will support the servo cover.



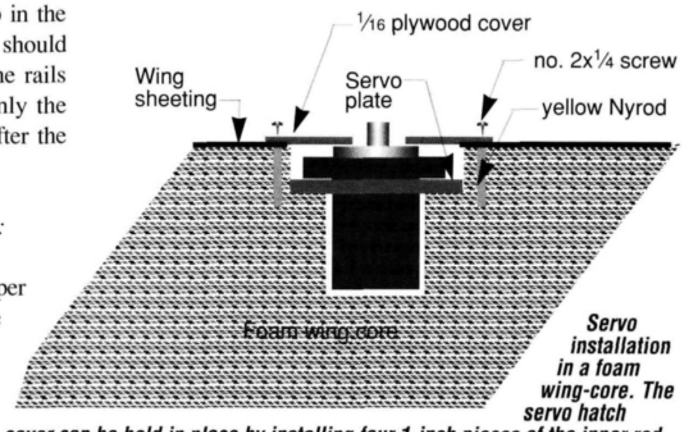
A complete Du-Bro pull/pull cable kit with one end assembled. Behind the clevis, note the locknut that prevents the clevis from turning under vibration. Attach the clevis to the control-surface-horn first. Secure the surface in the neutral position, and attach the pull/pull cable to the servo. Make the cable as tight as you can, then remove any slack by adjusting the clevis.

1/16-inch plywood doubler to each rib in the area of the rails. In either case, you should determine in advance how deeply the rails should be set in the wing so that only the servo drive wheel will be exposed after the wing skin has been applied.

Installing a servo in a foam wing-core:

- Make the servo-mounting plate first.
- Lay the plate on the wing at the proper location, and draw its outline on the wing.
- Remove the balsa skin in the area outlined.
- Now remove foam to a depth of approximately 3/8 inch.
- Position the mounting plate in the opening, and draw the center hole for the servo on the foam. Remove foam from this area to leave a foam shelf for the plate.
- Screw the servo to the plate and fit the plate into the opening. Adjust the depth of the hole so that the servo drive gear will extend past the wing skin when the unit is installed.
- Finish the installation with a lite-ply cover plate.

When installing a flap or aileron servo in a wing, install it as close to the control surface as possible, especially if it's for ailerons. We want to avoid flutter by keeping the pushrod short.



Servo installation in a foam wing-core. The servo hatch cover can be held in place by installing four 1-inch pieces of the inner rod from a red/yellow Nyrod. Drill an 1/8-inch hole through the wing skin into the foam, and epoxy the pieces of Nyrod into place. The hatch cover is secured with 2x1/4-inch screws.

PUSHRODS AND HARDWARE

In giant-scale aircraft, the controls are subjected to much greater stresses than they are on smaller models, owing to the increased weight, air loads and engine vibration. Properly installing pushrods, control horns and hardware makes a major contribution to the life expectancy of an aircraft.

Starting with the control horn, be sure that the horn is firmly secured to the flight-control surface. Aircraft plywood or a hardwood block should be built into the control surface, and the horn should be attached by screws or bolts. Control horns should not be attached to lite-ply because screws have a tendency to pull out of lite-ply under load.

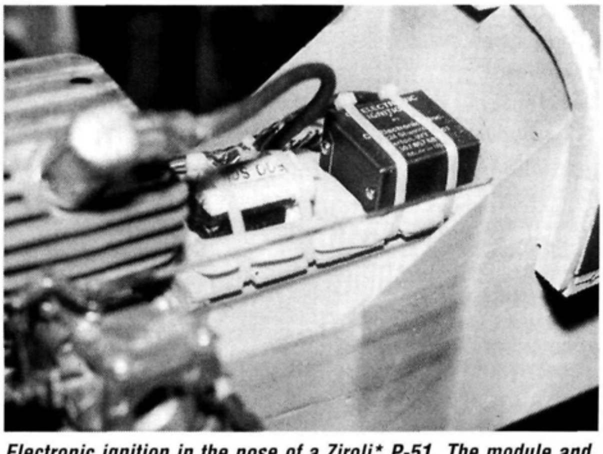
Control horns are available in a variety of sizes, shapes and materials. Robart Mfg.* offers horns that have a built-in ball link threaded for a 4-40 rod. These horns work well in most installations. Instead of a control horn, some giant-scale kits have a hardwood block or dowel installed in the control surface and a 4-40 bolt threaded into it to act as the control horn. I do *not* recommend the use of the threaded bolt; when I use this type of installation, I replace the bolt with 1/8-inch-diameter steel wire.

Most of my models contain one or more of these types of pushrods: arrow shafts, Nyrods and pull/pull cables. *Don't use* 1/4-inch-square spruce with a 1/16-inch-diameter wire end in your giant-scale aircraft. It *does not* work!

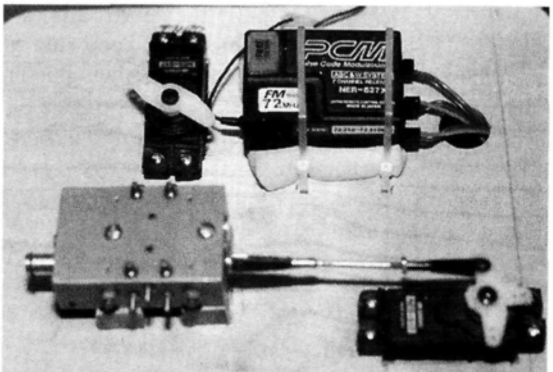
Arrow-shaft pushrods are commonly used for elevator control and, in some cases, rudder control. The use of 4-40 wire ends and hardware is a must; 2-56 wire and hardware aren't heavy enough for your big bird. I like to use a solder link on the servo end of the pushrod and a 4-40 Du-Bro* Kwik-Link on the horn end. Use a 4-40 nut behind the Kwik-Link to lock it into place. On all links, install keepers made out of 1/4-inch pieces of fuel tubing.

Most big birds have long pushrods, so pushrod-support braces must be built into the fuselage to eliminate the chance of their bending under load. The supports will also prevent the rods from vibrating when the engine is running. The line between the servo wheel and the control horn should be straight. It isn't acceptable to have a bend in the wire end of the rod, because the wire will bend even more under load. Keep the wire ends as short as possible; most of the rod's length should be the arrow shaft.

If the setup doesn't allow the installation of a straight-line pushrod, Nyrods can be used. Brace the Nyrods at intervals of at least every 6 to 10 inches in the fuse-



Electronic ignition in the nose of a Ziroli* P-51. The module and battery pack are mounted ahead of the firewall and away from the radio equipment. The on/off switch will be mounted on the cowl. The system shown is from C.H. Electronics* and is available with the Bosch resistor spark-plug cap.

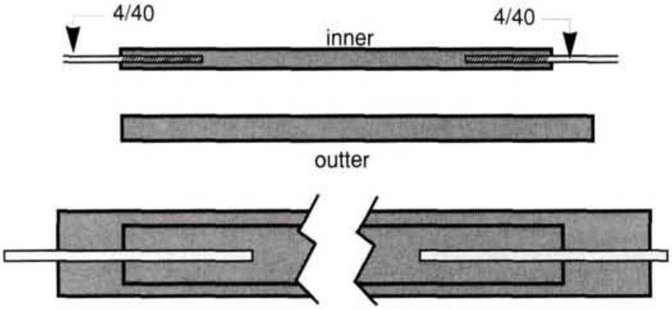


The equipment board being prepared for installation. This board holds the receiver, throttle servo, gear servo and landing-gear-air valve.

Robart control horn with built-in ball link. The clevis will accept a 4-40 threaded rod.

lage. With this type of rod, the outside tube will extend from the exit point at the rear of the fuselage to just a few inches from the servo. The inside tube should be cut shorter than the outside so that the wire ends will extend into the outside tube, and the inner tube will not be exposed when the servo is actuated.

For rudder control, my choice is pull/pull cables. Du-Bro offers the complete system with 4-40 hardware, and I usually use this system for tail-wheel steering, too.



This diagram shows Nyrods or a similar product. The inner rod is shorter than the outer one. Only the 4-40 wire extends from the outer tube.

Most aileron rods are made out of a piece of 4-40 rod that's threaded on one end and has a solder link at the servo. Use a Kwik-Link at the horn, and always try to keep the rods short.

RECEIVER AND BATTERY-PACK INSTALLATION

The receiver is mounted on a plywood board; ½-inch-thick foam is inserted between it and the board, and the receiver is held in place with plastic wire ties. Whenever possible, I mount the receiver on one of the servo boards, and I mount the battery in a similar fashion.

I often see modelers using rubber bands to hold the receiver and battery in place. This is a crash waiting to happen. At some point, the bands will fail, and the receiver or battery will come loose inside the aircraft. In most cases, the battery will be mounted in the nose for balance. Remember: the battery must be accessible, secure and shock-mounted to prevent it from being affected by engine vibration.

When connecting the servo wires to the receiver, band the wires together with ties and secure them to the aircraft's interior to keep things neat. The wires should be long enough to allow a little slack. We don't want the wires to be pulled out of the receiver or to have the plug fail owing to vibration. The antenna wire should not be banded with the servo wires. Keep it separate! If the antenna is to be mounted on the aircraft's exterior, install a stop where it exits the fuselage, then secure its end with a rubber band.

ELECTRONIC-IGNITION ISOLATION

This may be your first aircraft with an electronic-ignition-equipped engine. Ignition systems have an ignition module, a battery pack and an on/off switch. The high voltage created by the system can cause radio problems. In most cases, the chance of this happening can be eliminated by isolating the system.

When using a system of this type, I *always* mount the module, battery and switch on the front of the firewall away from the radio components. *Never* mount the radio and ignition batteries and switches together. If your engine has a captive discharge ignition, you'll only have to install an on/off switch. Again, mount the switch away from the radio.

The very best radio installation will still require inspection and maintenance. You'll lengthen the life of your aircraft if, prior to every trip to the field flying, you carefully inspect the radio installation and always maintain your battery.

Remember: big is better!

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

PILOT PROJECTS

A LOOK AT WHAT OUR READERS ARE DOING

SEND IN YOUR SNAPSHOTS

Model Airplane News is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable.

All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of 1995. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897.

FRENCH CONNECTION

Bob Botha of North Mankato, MN, built this CAP 10B from a Yellow Aircraft kit. Bob says that this 74-inch-span, 16½-pound plane is his "first serious attempt" at scale modeling after some 40 years in the hobby. The seats were sculpted out of Styrofoam, sealed with epoxy and clearcoat and then hand painted—including the stitching. To make the instrument panel, Bob made a negative of a drawing, reduced it, and secured it between plastic and acetate and lite-ply. We're impressed, Bob!

FJORD FLOATER

This 85-inch-span Noorduyn Norseman belongs to Bruce Mornan of Greenwood, Nova Scotia, Canada. He built the model from a Unionville Hobbies kit. Bruce says that the plane "flies like a dream on the 40-inch-long BJ floats and is hard to tell from the real thing in the air." An O.S. .91 Surpass keeps the Norseman in the sky.

SHINING ESCORT

John Stare of New Castle, DE, spent four years building this .005-aluminum-covered P-51D. The exhaust area is made of stainless steel, as are the struts, which John made using a saw and a file. The tanks are functional, and the model also has a full cockpit, sequencing doors, a sliding canopy and slow-retracting flaps.

CUB IN NAVY COLORS

Donald Gallian of Chicago, IL, didn't want to model "another yellow Cub," so he found documentation for this NE-1 version in "Piper Cubs," by Peter M. Bowers. The Great Planes model is covered in light-gray MonoKote with Chevron Perfect Paint "Extra Dark Sea Gray" camouflage and "Dead Flat" finish. The markings and lettering are by Aero FX. A side-mounted O.S. .61 with a Slimline Pitts-style muffler powers the Cub on its missions over Illinois.

PILOT PROJECTS

SNAKE IN THE GRASS

Bill Maciborski of Stedman, NC, built this AH1G Huey Cobra from a Bobby Daniell kit. It has a rotating front gun turret, and the stub-wing mini-gun pods have small Estes rocket motors in them to simulate the smoke and flames of full-size mini-gun fire. The 6-foot-long model has a 6-foot main-rotor diameter and weighs about 14 pounds.

SOVIET SKY DANCER

This profile fun-fly model is Mike SanMiguel's first scratch-built project. He used a Hots airfoil, lengthened the wingspan to 46 inches and cut out his own profile version of a Sukhoi. He added the extra wing area so that the model could handle an O.S. .61. Mike says that his model has almost unlimited vertical performance and is very agile.

TWO-SEAT TRAINER

This Gee Bee Products Tiger Moth was built by Ron Polk Sr. of Moreno Valley, CA. The 45-inch-span, 6-pound model is pulled through the sky by a Magnum .40. Ron says, "After about 100 hours of loving labor, and with the addition of two pilots with fur collars and white scarves and some minor alterations, this model flies well and is a great competitor in our Saturday scale fly-ins."

CURTISS CLASSIC

Phil Yovino of Port Washington, NY—the third-place winner in our 1994 "Pilot Projects" contest—sent this photo of his latest creation, the Curtiss F-11 C1. He scratch-built the plane from Wylam 3-views. Powered by a Quadra 52 gasoline engine, the 26-pound model is aerobatic and very fast.

SUPERB SANDY

Scott Gehrke of Amery, WI, spent five years as an aviation electrician and air crewman on the full-size aircraft after which this Skyraider was modeled. Built from the Global kit, the model's airframe and canopy were modified to convert it to an AD-5N version, and the searchlight and pod were made out of a mailing tube, Styrofoam and a nylon-stocking container. The handmade prop is pine that was twisted while wet. Scott says that because he has back problems and can't take his models to the field, they fly "never-ending missions" from his living-room ceiling.

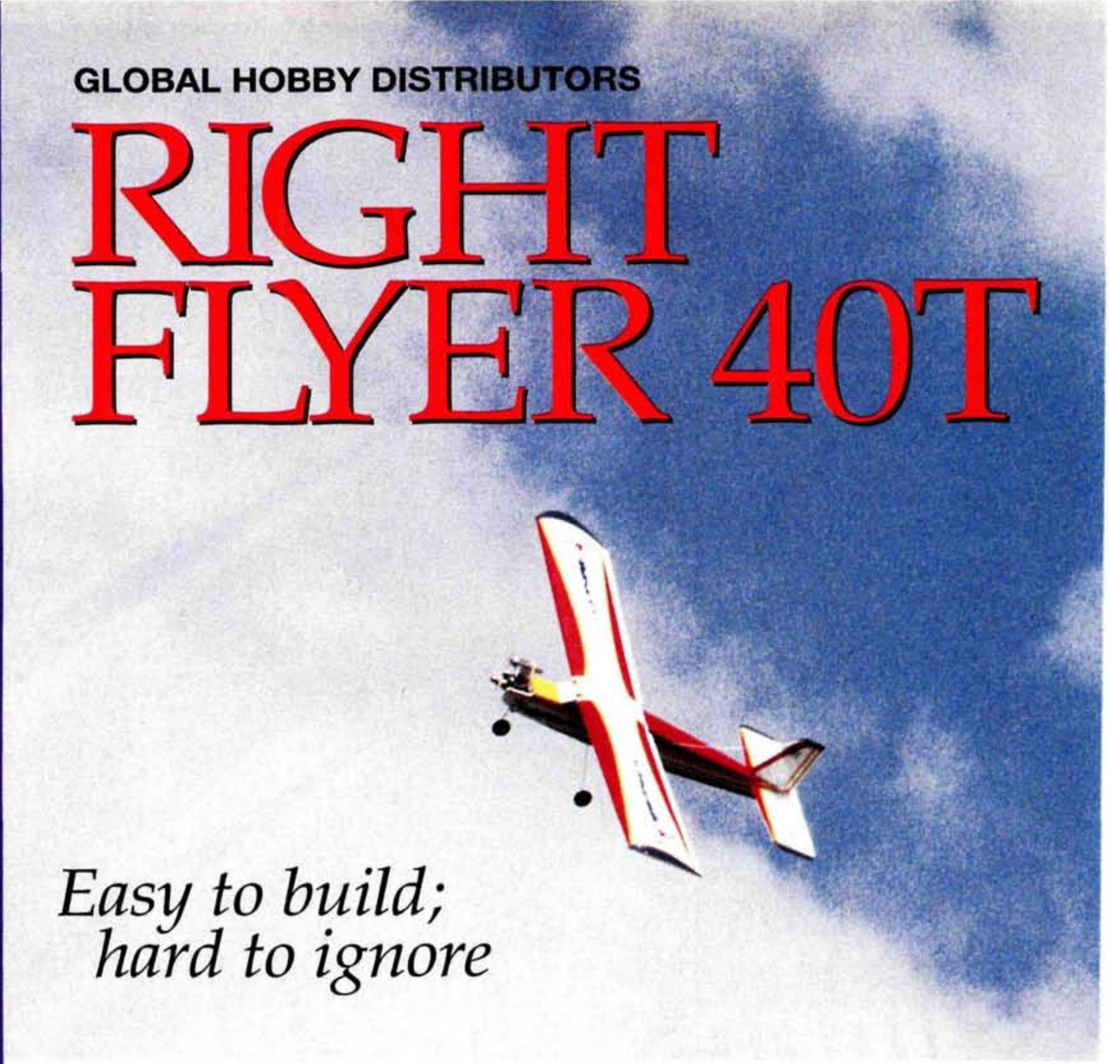
LINCOLN'S BONES

Ralph Beck of Beloit, WI, scratch-built this ⅓-scale Lincoln Sport from 1925 factory drawings. The 80-inch-span, 24-inch-high model will be powered by a Saito 270 twin engine. Ralph also built the pilot, which has a head that can turn. The model has a 4-inch-diameter spinner, a 20x10 prop, Williams Bros. vintage wheels and Du-Bro turnbuckles. We're looking forward to seeing the finished model, Ralph; it should be a beauty!

FIELD & BENCH REVIEW

GLOBAL HOBBY DISTRIBUTORS

RIGHT FLYER 40T



Easy to build; hard to ignore

PHOTOS BY JOHN FINCH

by JOHN FINCH

SPECIFICATIONS

Model name: Right Flyer 40T

Type: trainer

Manufacturer: Global Hobby Distributors

Length: 49 in.

Wingspan: 64 in.

Wing area: 740 sq. in.

Weight: 5 lb., 6 oz.

Engine: .40 to .46 2-stroke

Radio: 4-channel

Airfoil: flat-bottom

List price: $129.95

Features: completely factory-built and covered; ready to assemble; a complete hardware package; illustrated instruction booklet.

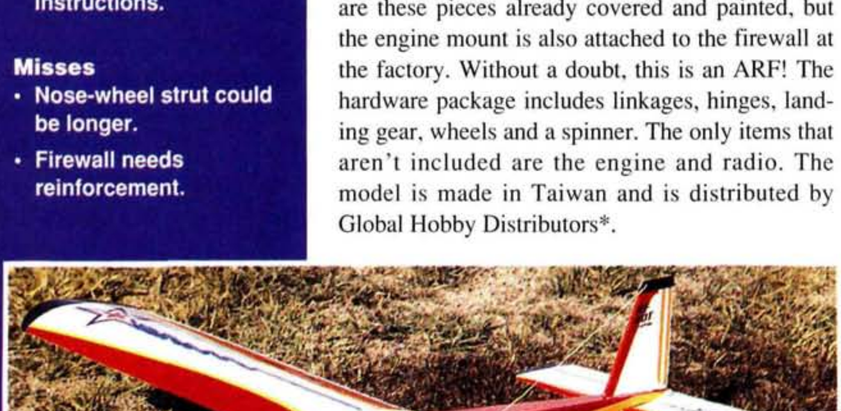
Hits
- Dynamic color design.
- Complete hardware kit.
- Quick assembly.
- Factory parts are straight and true.
- Easy-to-follow instructions.

Misses
- Nose-wheel strut could be longer.
- Firewall needs reinforcement.

THE RIGHT FLYER 40T is structurally similar to many other trainers on the market today, but it is distinguished by its outgoing personality. It also has a bold color scheme that demands attention at the flying field.

THE KIT

The airplane arrives in five basic pieces. Not only are these pieces already covered and painted, but the engine mount is also attached to the firewall at the factory. Without a doubt, this is an ARF! The hardware package includes linkages, hinges, landing gear, wheels and a spinner. The only items that aren't included are the engine and radio. The model is made in Taiwan and is distributed by Global Hobby Distributors*.



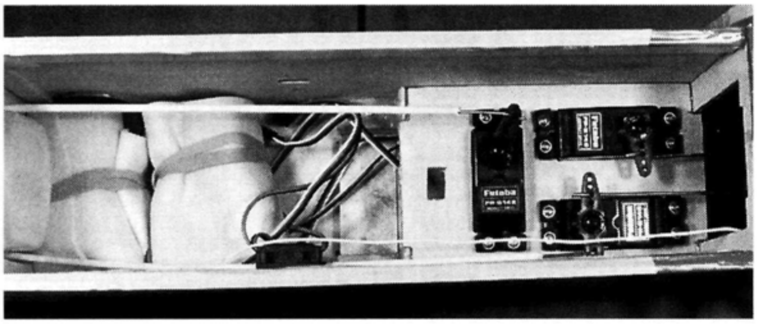
CONSTRUCTION

Construction took six hours from the moment I opened the box until the airplane was complete! I use the word "construction" guiltily, because most of the construction had already been completed at the factory. This, and the easy-to-follow instructions, photos and diagrams helped the kit go together quickly.

I found only one mistake in the instructions and that was on page 12, which explains how to join the servo tray to a short support leg. If these two pieces are glued together on the workbench, the assembly won't fit into the fuselage. They must be glued into the fuselage as separate pieces.

A beginner who doesn't read the instructions might think the ailerons, elevator and rudder are ready to go. They aren't! The hinges are only slip-fit into their respective parts; they must be removed and then re-attached using epoxy glue. If you follow the instructions, you'll have no problems with this.

The only drawback to the pre-constructed model was the firewall. It looked as if it had been spot-glued with a hot-glue gun, and sure enough, at the field, it broke loose on the first rough landing. To repair it, I sanded a section of the paint to bare wood and then used epoxy to glue the firewall to the fuselage. After I had made this repair, I had no



Note that the battery pack is just in front of the receiver. To move the CG forward, I later moved it to just behind the firewall, under the fuel tank.

The Right Flyer 40T is as complete an ARF as you will find. Even the wheels and nose cone are included. The wing—not shown—arrives in two pieces that are easily glued together.

problems with the firewall breaking loose. When you build this model, you might consider filling the firewall joint with a liberal amount of CA glue and some kicker for extra strength.

Be sure to note the thread size of the control linkage because this and the control-rod clevis aren't standard 2-56-size threads. You must use the clevis provided with the kit. A standard American 2-56 threaded clevis can be screwed onto the rod, but it's slightly larger and will slip off the threads when put under pressure.

When construction was complete, the airplane was tail-heavy. To achieve the proper center of gravity (CG), I added 6 ounces of stick-on weights to the inside of the engine compartment. On the second trip to the flying field, I achieved a proper CG location in another way. I added a 2-ounce Harry Higley* spinner weight to the engine in place of the plastic spinner supplied with the kit, and I installed a flat-pack receiver battery under the fuel tank, just behind the firewall. With these two modifications, the lead weights could be removed. This reduced the overall weight of the aircraft while still maintaining the proper CG.

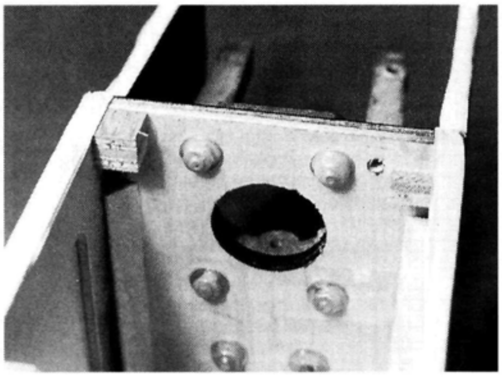
AT THE FIELD

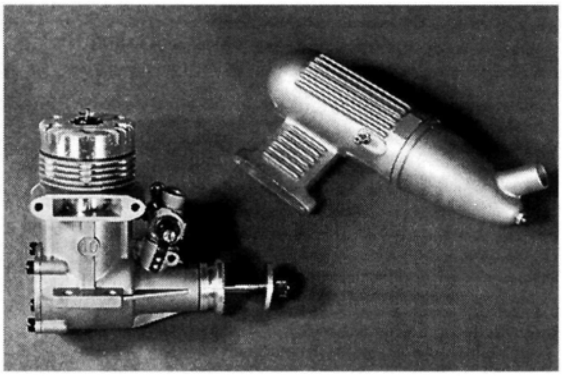
I'm a rookie when it comes to flying, so I called on Chris Gautier—an old friend and good pilot—to help me with the flight review. With one rookie and one experienced flier, we had two perspectives from which to review the airplane.

Chris primed the engine and finger-flipped the prop. The engine fired on the first flip and started on the second flip. Changing between idle and full speed, we ran a tank of fuel through the engine. The Magnum .40 peaked out at 10,600 static rpm running a little on the rich side. The idle had been preset at the factory to 3,200rpm. We left it there and ran two tanks of fuel through the engine to break it in.

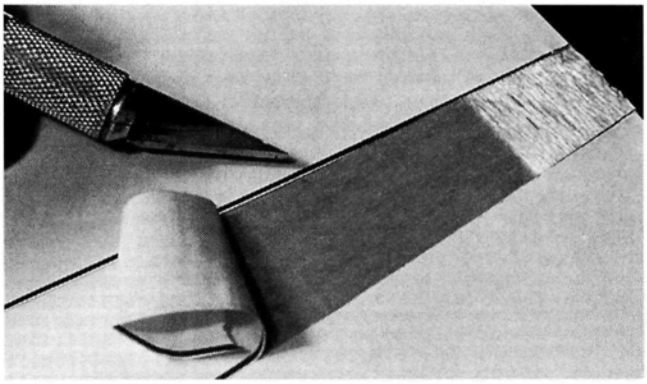
The nose-wheel strut in the kit was short, and that gave the wing a negative angle of attack (AOA). This AOA made the airplane jump up quickly on takeoffs. To get zero wing incidence, the nose-wheel strut must be lowered so that the upper end of the strut doesn't fit into the engine-mount strut support. In other words, you can adjust the strut for proper length, but the lower strut support becomes the only support. I later installed a longer strut that's supported by both the lower and upper strut supports. With proper nose-wheel length, takeoff was smooth and predictable.

Chris was the experienced flier so naturally, he flew the first couple of flights. To feel the plane out, he did a few stunts and some stalls. On stall, the plane's nose simply dropped—a good attribute for a trainer, he said. When I asked Chris for a few words to describe the handling characteristics he replied, "Flies easy, gentle, and flies well at slow speeds." Hey, that sounds like a trainer to me! He also said that the engine was more than adequate for the model and a good





Above: the firewall was the only weak link in the airplane. It looked as if it had been hot-glued onto the painted sides of the model. During testing, it broke loose, but we replaced it using epoxy. I recommend epoxy instead of hot glue for this task. For a better bond between the firewall and the fuselage, first sand the areas of the fuse to which the firewall will be glued. Above right: this Magnum .40 GPA engine worked flawlessly.



An X-Acto knife is one of the few tools that you need to assemble this airplane. Here, the covering has been removed from the stabilizer before it's glued to the fuselage.

FLIGHT PERFORMANCE

• Takeoff and landing

With its tricycle landing gear, the Right Flyer is easy to steer on the ground, and it's easy to keep straight on grass runways during takeoffs. It jumps off the runway quickly when the short nose-gear strut is used, but takeoffs are smooth and predictable with the extended nose-wheel strut. At low speeds, it floats lightly and smoothly for easy landings. I saw no tip-stall tendency on slow approaches.

• High-speed performance

Full-throttle flying took the model to a safe altitude and a moderate pace—good for a beginner. Loops were a snap, but rolls were awkward. Keep in mind that this isn't a stunt airplane! It's designed to keep beginners out of trouble. Half-throttle flying agreed with the Right Flyer; it reacted well to commands at half throttle and has positive response.

• Low-speed performance

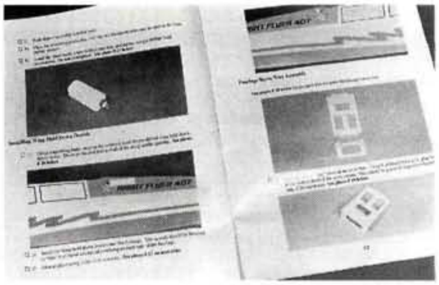
This model flew very well at slow speeds and was fun to fly—perfect for a beginners' aircraft. When I put it into a stall, its nose just dropped slightly, and recovery was easy by simply releasing the pressure on the elevator stick.

• Aerobatics

The model will do all the normal 4-channel maneuvers, and the Magnum .40 GPA engine has plenty of power. Rolls are slow and loops can be big or small. Inverted flight is a bit tricky (wants to roll upright) and a fair amount of down-elevator is required to fly straight and level. The model flies as it should for a trainer, but it can deliver some good performance for the fledgling R/C pilot.

value for the money.

From a beginner's point of view, I agree that the model takes off smoothly and predictably. It flies slowly enough to give the beginner time to think before reacting to stick movements, and it feels light in the air. On calm days, it settles into landing very nicely, but on windy days, it takes an experienced pilot like Chris to land it safely.



The comprehensive instruction manual is easy to follow. Note: the photos help to guide first-time builders.

CONCLUSION

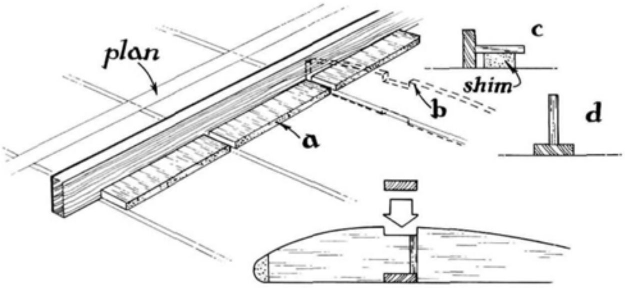
The Right Flyer 40T and the Magnum .40 GPA engine are a right-on-target combination for the first-time flier. The Magnum GPA has more than adequate power for the Right Flyer 40T. It's economical at the fuel tank and very easy on the wallet. The engine starts easily and is very quiet. You get a lot of bang for the buck in this user-friendly model.

** Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

HINTS & KINKS

JIM NEWMAN

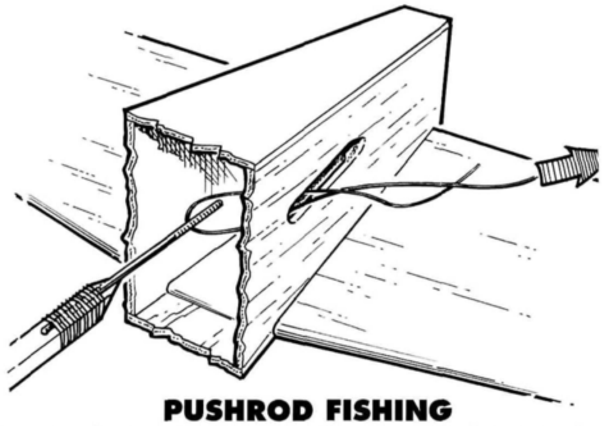
Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



EASY WEB ASSEMBLY

Cut all the shear webs to size, turn the spar on its side and, using a rib (b) as a spacer, glue the webs (a) into place as shown. Stand the spar upright to add the ribs and the top spar. Sketches (c) and (d) show how, if you so wish, you can use a shim to center the webs during assembly; a centered web is structurally more balanced.

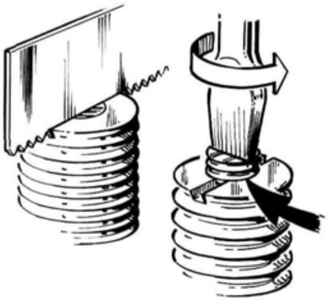
David Lewis, Bay Village, OH



PUSHROD FISHING

Insert a florist-wire loop into the pushrod slot and, when the pushrod has been snared, pull it out through the slot and attach the clevis.

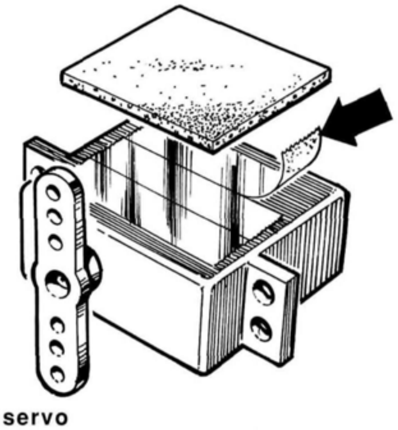
Jim Blankenship, Lubbock, TX



BROKEN SCREW EASY-OUT

To fix a broken spinner-retainer screw on an electric plane, saw a fine slot across its end, then use a very small screwdriver to back out the piece that's left in.

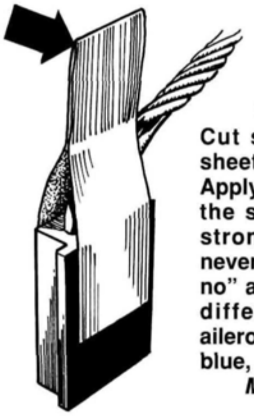
Frans Sant, Haarlem, Netherlands



EZ-OFF SERVO TAPE

Before applying servo tape to the servo, cover the side of the case with Scotch tape. If the servo tape ever has to be removed, just peel off the Scotch tape along with the foam tape. It's easy to remove, yet it holds the servo firmly in place.

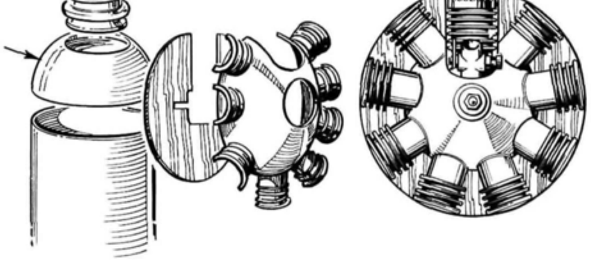
Goran Forsberg, Lulea, Sweden



SERVO PLUG TAB

Cut strips of self-adhesive trim sheet as wide as your servo plug. Apply the ends of the folded strip to the sides of the plug to create a strong pull-tab so that you need never pull on the wires (that's a "no-no" anyway). Mark each plug with a different color, e.g., make the aileron servo red, the elevator servo blue, etc.

Michael Saponara, Flushing, NY



2-LITER DUMMY

To make a convincing dummy radial engine, trim a soda bottle as shown—shaping the dome to fit around the engine—glue it to a fuelproof plywood backplate/air baffle, and then glue the split necks into place to form the cylinders. Paint it, and add aluminum tube pushrods and plug leads.

Jeff Christie, Visalia, CA

FIELD & BENCH REVIEW

SPECIFICATIONS

Model name: Midwest Extra 300S

Type: low-wing stand-off-scale plane

Manufacturer: Midwest Products

List price: \$359.95 (\$250 discounted)

Wingspan: 80 in.

Wing area: 1,162 sq. in.

Wing loading: 30 oz. per sq. ft. (approximately)

Weight: 14 to 15 lb. with a Moki* 1.8 or SuperTigre* 3000

Length: 72 in.

Engine: glow—Moki 1.8 and SuperTigre 3000; gas—Zenoah* G45 (recommended)

Engine used: Moki 1.8

No. of channels req'd: 4

No. of servos req'd: 6 (2 aileron, 2 elevator, 1 rudder, 1 throttle)

Kit construction: pre-cut balsa and lite-ply; built-up

Hits
- Easy to build quickly.
- Attractive, scale-like appearance.
- The locking design and various jigs supplied with kit ensure straight construction.
- Excellent instructions and drawings.
- Precision-cut, high-quality wooden parts.
- Excellent flying capabilities.

Misses
- ABS cowl parts did not fit the fuselage very well.
- Turtle deck requires a lot of shaping to feather it into the fuselage.

MIDWEST PRODUCTS

Extra 300S

by ROB WOOD

An IMAA-legal aerobatic performer

IMAGINE, if you will, a garage full of model airplane parts: there's a wing leaning in one corner and some fuselage sections in another; some formers and a spinner or two are piled on the table; and there's a collection of stabs in the rafters.

"Sounds pretty typical," you might say.

Now, imagine you walk into that garage one day; you stroke your chin a few times, and you decide that you're going to combine some of these spare parts to make a new model design. Without plans or blueprints, you begin to attach one part to another, until a new airplane begins to take form.

"Interesting, but hardly unusual," you think.

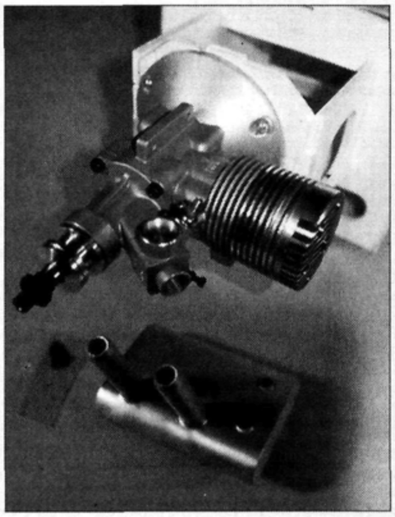
Now, imagine that an accomplished pilot takes your finished creation and immediately wins national and international world aerobatics competitions with it.

"Unbelievable," you exclaim.

Unbelievable? Maybe so, but that's exactly how Walter Extra designed the Extra 260, which ultimately became the prototype of the Extra 300S. Patty Wagstaff won three national championships with the one-of-a-kind Extra 260 (serial number 001). Later, she repeatedly requested that Walter send her copies of the original stab drawings for a rebuild; she finally received them in the mail—drawn on two napkins! Patty has since donated her Extra 260 to the Smithsonian Air & Space Museum and replaced it with Walter's latest creation—the Extra 300S.

BEGINNING THE DESIGN

When well-known pattern and Tournament of Champions (TOC) competitor Mike McConville of Midwest Products* designed Midwest's new Extra 300S, he didn't use napkins; instead, he scanned a 3-view of the aircraft (obtained from Aerosport,



The Moki 1.8 glow engine and a Bison muffler were used to power the Extra 300S. At ½ throttle, the Moki provides more than enough power for most IMAC maneuvers.

Moki Muscle

Capacity: 1.8138 (29.72cc)

Bore: 1.377 (34.9758mm)

Stroke: 1.218 (30.937)

Stroke/bore ratio: 0.884:1

Timing Periods

—exhaust: 150 degrees

—transfer: 118 degrees

Front induction: opens 43 degrees ABDC; closes 63 degrees ATDC; total period 200 degrees; blowdown 16 degrees

Maximum b.hp: 4.03 at 8,730rpm (Mac's Q-pipe at 400mm length/5-percent nitro.)

Maximum torque: 496 oz.-in. at 7,020rpm (Mac's Q-pipe at 480mm length/5-percent nitro.)

importers of the full-scale airplane), transferred the scanned image to AutoCAD and developed the plans on a computer. The design philosophy revolved around aerobatic performance, appearance, ease of construction and size. On the heels of Midwest's success with the AT-6 Texan, the Midwest team decided to create a model that was just big enough (80-inch span) to meet IMAA minimum specs for giant scale and to incorporate TOC design parameters for flight performance.

FLIGHT PERFORMANCE

• Takeoff and landing

Builder Ken Adlawan started up the Moki 1.8 with a few flips of the 3-inch Tru-Turn spinner (rather than flipping the Zinger 18x8 prop—a much safer way of hand-starting a larger engine.) After leaning out the high-speed needle a few clicks, the engine ran steadily with the Extra held in a vertical position, so we decided to go for the flight test. The aircraft tracked nicely down the runway and lifted off in approximately 50 feet. Ken reduced the throttle to 50 percent and trimmed the Extra with one click of right aileron and one click of down-elevator.

Landing was set up in a standard left-hand approach. Chopping the throttle produced a noticeable (but acceptable) sink, and the aircraft tracked straight down the runway for a three-point landing under power.

• Low-speed performance

This was excellent and had superb aileron authority.

• High-speed performance

The Moki 1.8 provided more than enough power at ½ throttle for most IMAC maneuvers. The aircraft showed no pitch changes throughout the full throttle range.

• Aerobatics

General tracking characteristics—straight and true with hands off.
Vertical performance with the Moki 1.8—slowed down to approximately 10 mph but continued to climb for unlimited vertical; required slight right-rudder and up-elevator to maintain perfect vertical attitude.
Adverse yaw—very little, possibly owing to 25-percent down aileron differential mixed in.
Inverted flight—very slight down-elevator required.
¾ loop (square back side)—crisp and clean.
½ Cuban-8—excellent, with sharp roll response.
Immelmann—excellent tracking, crisp roll-out on top.
Two-point roll (3 seconds)—excellent, with very little elevator and rudder input needed.
Split-S—excellent; tracked nicely.
½ reverse Cuban-8—predictable and clean.
Inside loop—tiny bit of rudder required for perfect loop.
Hammerhead—slight right rudder input necessary for perfect Hammerhead.
Humpty Bump with a pull, ½ roll down—excellent.
Cuban-8—excellent.
Knife-edge flight—easily sustained with full rudder; strong rudder authority.
Slow roll—very smooth with minimal elevator and rudder input.
Rolling circle—smooth and predictable.
Spin—very slow stall speed, gentle control input required for excellent spin.
Tail slide—tended to fall over on its back, but may be a function of tweaking the trim settings. Also, with the CG set according to the instructions, the airplane seemed to be a bit too nose-heavy for advanced aerobatic control; but this is a matter of personal taste.

• A talk with Ken Adlawan

MAN: *Ken, how do you feel about this airplane?*

Ken: I love it! It flies great—nice and smooth. Best plane I've flown in a long time. It's a tiny bit nose-heavy for my taste, and since I have 8¼ ounces of lead up front, I'll probably take off 1 ounce at a time until the CG is where I want it.

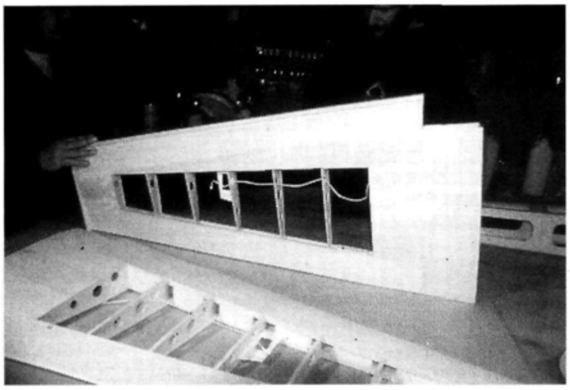
MAN: *How about some final words on building the kit?*

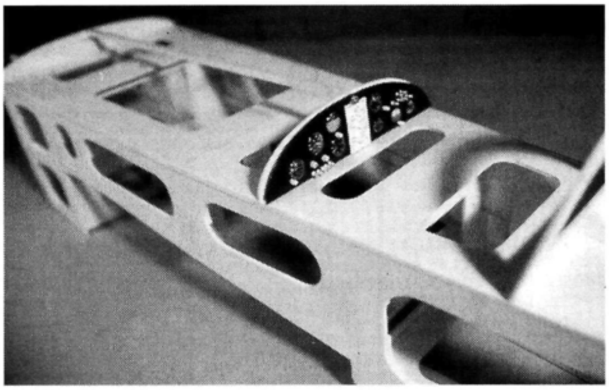
Ken: I built it according to the instructions; it went together really well, and the wood was absolutely perfect. I haven't built a kit this good in a long time, and I was really impressed with the way the parts fit. For wood to fit this well, I'd say it's about as precision-cut as you can get.

This airplane is designed for the accomplished builder who loves to fly and who can appreciate a model that will do exactly what it's directed to do—for both a day of pleasure and serious aerobatic competition.

ENHANCEMENTS

To enhance the model's performance, Mike made some changes to the full-scale design.
• To eliminate pitch coupling, which is the tendency of an aircraft to pitch toward its belly with the application of rudder, he lowered the stab.
• To increase tracking performance and improve appearance, he slightly stretched the fuselage aft of the wing.
• To decrease frontal-area drag, he slightly narrowed the fuselage.
• For ease of construction, he replaced the horizontal stab airfoil with a flat one.
• For the wings, he incorporated the airfoil from his highly successful pattern ship (Desire).





Far left: the wing halves before they were joined. The quality of wood throughout the kit is very good.

Left: for spice, a ready-to-install instrument panel (available from Midwest) was added to the cockpit. It even includes a clipboard with an aerobatic flight plan attached.

THE KIT

To realistically test this concept, Mike built the prototype (which he still flies, by the way) with the same materials and hardware that come with the production kit. The prototype performed beautifully with no design changes required.

The kit comes with all hardware and other materials necessary for construction, including aluminum landing gear and ABS plastic cowl and wheel pants. The instructions call for gluing the ABS parts together with PVC plastic cement (not included), but the cement we purchased from a local hardware store didn't work. According to Mike, some builders have complained that certain brands of cement actually "eat" the plastic parts. Midwest experimented to find the best brand, and they recommend Ace Hardware PVC cement (no. 43622). We used CA to join the parts, and glassed them on the inside with epoxy resin. If you have a little disposable income, you might consider purchasing fiberglass pants and cowls from one of the aftermarket specialty houses.

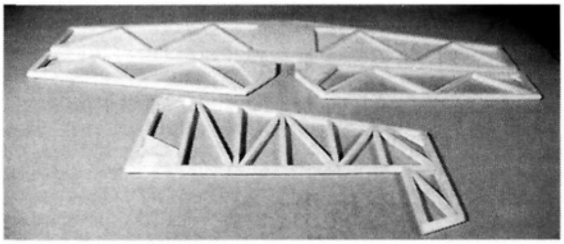
The lite-ply fuse parts are designed to lock together in such a way that they prevent misalignment, and the balsa wing ribs come with trailing-edge tabs that prevent the ribs from being twisted during assembly. Although the one-piece construction makes for a very strong and straight wing, it measures 80 inches in span, which makes it prone to hangar rash. The 80-inch span may also make transport in the family car a bit difficult, but in this case, the end may justify the means.

FINISHING TOUCHES

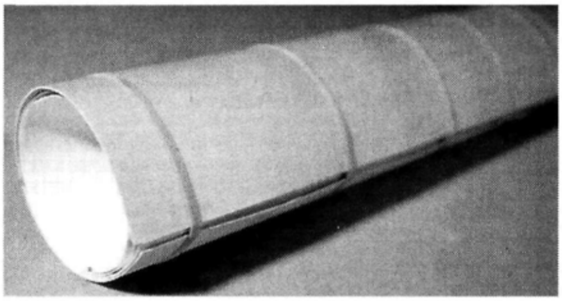
The model was covered with Goldberg Ultracote*, and to match the flame-red color, Perfect Paint was used on the cowl. To complete the scale look, we used Midwest's new instrument panel, which comes completely assembled and ready to install (and must be seen to be believed!).

Midwest discovered that some modelers were experiencing elevator flutter at higher speeds. They investigated and determined that when modelers move the elevator clevises inward to the base of the control horns to increase throws, there's a loss of mechanical advantage that can lead to elevator flutter in some high-speed scenarios. Midwest recommends that, for increased throw, modelers use longer servo arms. The clevis at the elevator should be mounted at the outermost control-horn position. This is good, standard building practice for all larger aircraft, and it maximizes mechanical advantage.

From clearly written instructions to precise drawings, every precaution has been taken to ensure a straight-and-true finished plane. The kit's top-quality parts are precision-cut, and virtually no modifications are required to make them fit. In short, this is an excellent kit; it's easy to build and is a great-flying aerobatic performer suitable for competition on the IMAC circuit.



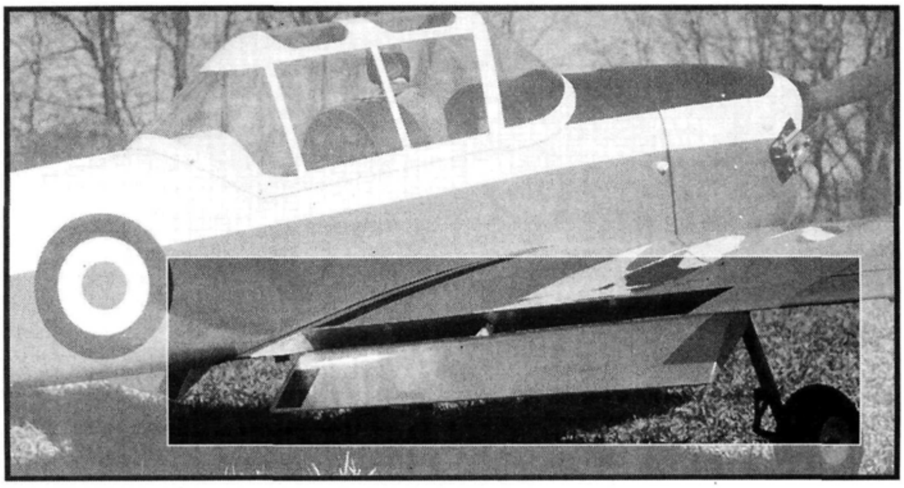
The strong, light tail parts are stick-built.



To make attachment of the plywood turtle deck easier, the plywood sheeting is "pre-bent"; it's rolled up into a tube and held in shape with rubber bands.

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

HOW TO



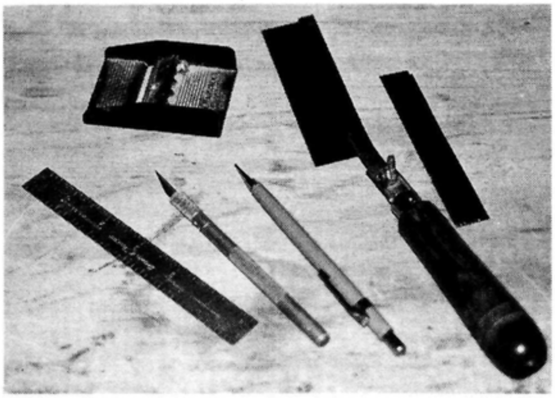
Here's my Ohio R/C* deHavilland Chipmunk military trainer with the slotted flaps in the down position. Although the stock model doesn't need flaps to fly well, they sure look good when they're lowered. Flaps are a great addition to any model.

Make Slotted Flaps

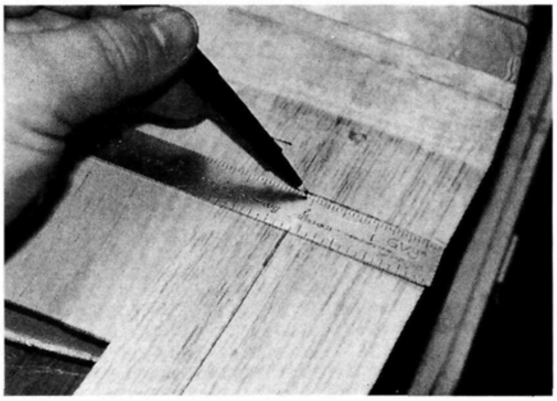
by GERRY YARRISH

AMONG SCALE MODEL builders, functional flaps are the most popular modification (followed closely by retracts). Their benefits range from improved takeoff and landing performance to improved scale appearance and static scores. Complicated flap designs, however, have prevented many modelers from modifying their planes. Here's a simplified way to add slotted flaps to your next project.

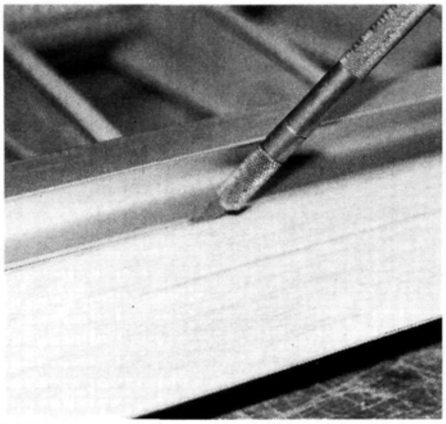
A simple solution to a complex problem



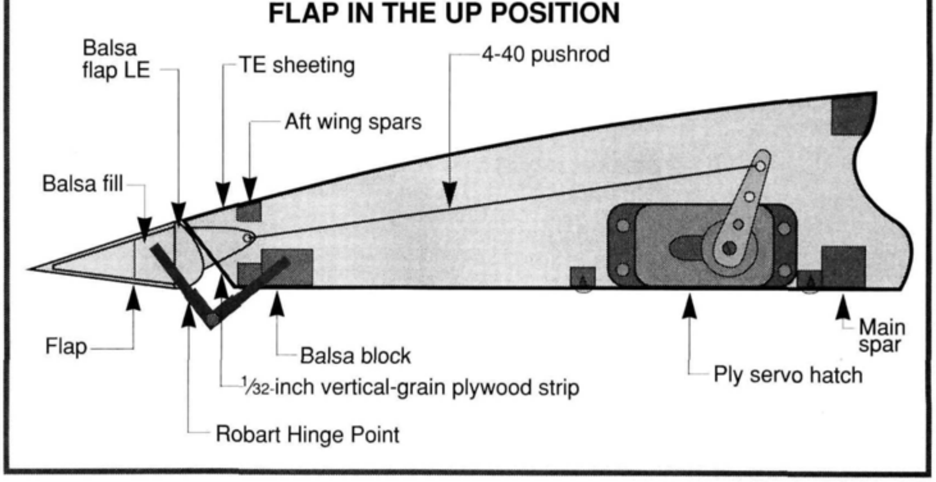
1 The tools needed are few: pencil, X-Acto knife, ruler, razor saw and razor plane. Not shown: a long straightedge (an aluminum L-angle), Robart* Hinge Point hinges, $\frac{1}{4}$- and $\frac{3}{8}$-inch-thick sheet balsa and glue.



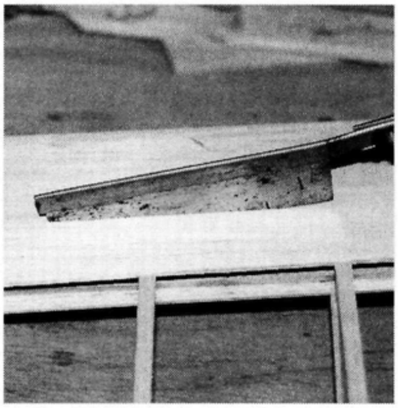
2 First, measure and mark the width and length of your flaps on the wing's trailing-edge sheeting (the top and bottom surfaces). The width on my Chipmunk was $2\frac{1}{8}$ inches. (It's a good idea to make the ailerons now because they require the same tools and techniques as the flaps.)



3 Using the straightedge as a guide, cut the flap's leading-edge lines with a sharp X-Acto knife. Make several passes until you've cut completely through the sheeting. Cut the wing's top and bottom surfaces. Don't cut deeply into the ribs; just "float" the knife over them.

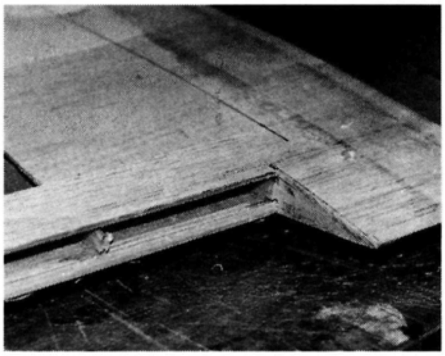


4 *Cut the ends of the flaps with a razor saw, and mark the end cut so that it's alongside one of the ribs. If the end of the flap falls between two ribs, add a balsa endcap between the upper and lower sheeting.*

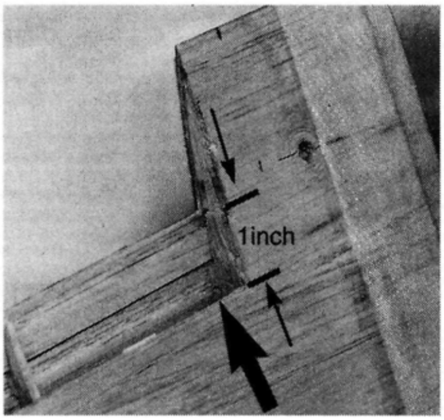


5 *Using the razor saw, cut through the ribs along the leading-edge cut line. Cut as deeply as possible from the top, and complete the cut from the bottom.*

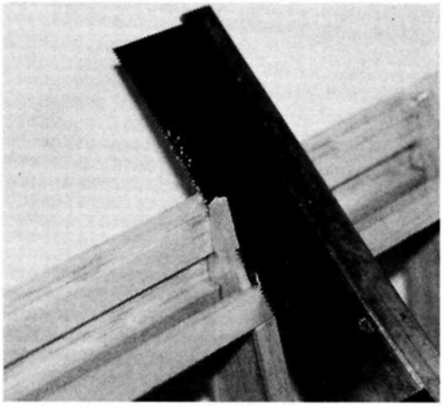
6 *Separate the flap (and aileron, if applicable) from the main wing structure. The flap should fall freely from the wing; if it doesn't, check for any ribs that haven't been cut all the way through, and cut them again with a razor saw.*



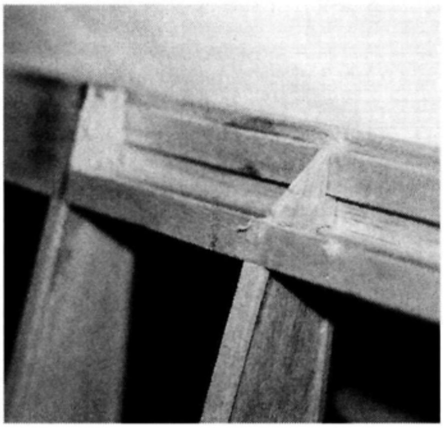
7 *Here's a close-up of the inboard end of the flap cutout. Notice that the wing rib fills the space between the upper and lower trailing-edge sheeting. Now flip the wing upside-down.*



8 *Mark a new leading-edge cut line 1 inch in front of the bottom leading-edge cut line. Cut through the sheeting, but do not cut into the ribs at this time. Remove the strip of sheeting.*



9 *With a razor saw, cut the rib's exposed trailing edge at the angle shown. To keep the edges straight, try not to cut into the top or bottom sheeting with the saw.*

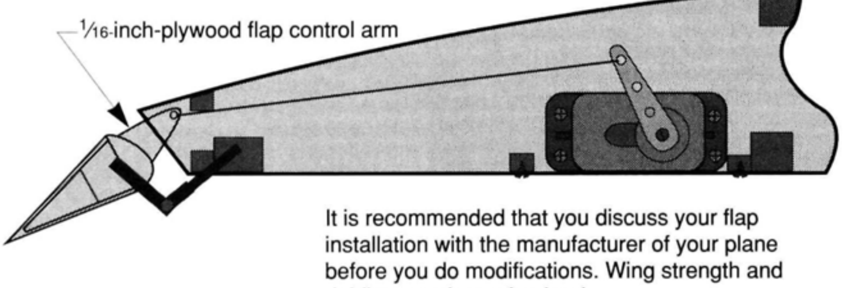


10 *This is what the rib should look like after the cut has been made.*

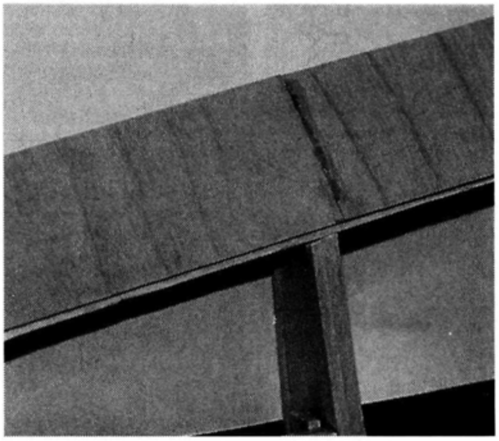
11 *Left: using a wide sanding block and 80-grit sandpaper, sand the edges of the top and bottom sheeting flush with and matching the edges of the rib's trailing edges.*

12 *Below: cut vertical-grain strips of 1/32-inch plywood about 1/8 inch wider than the opening in the wing's trailing edge, and glue them into place. Butt them up against the end ribs in the flap cutout area. These strips strengthen and stiffen the wing's structure.*

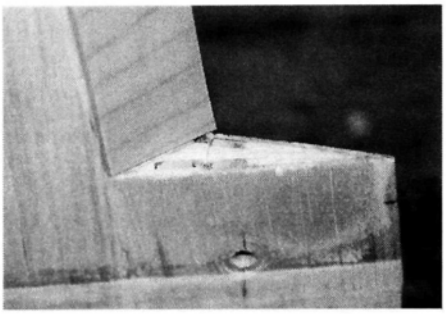
FLAP IN THE DOWN POSITION



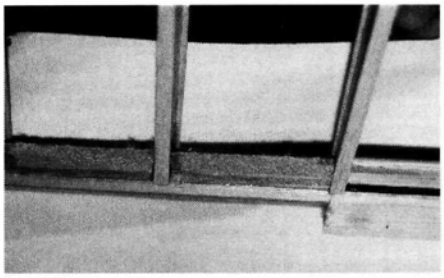
It is recommended that you discuss your flap installation with the manufacturer of your plane before you do modifications. Wing strength and rigidity must be maintained.



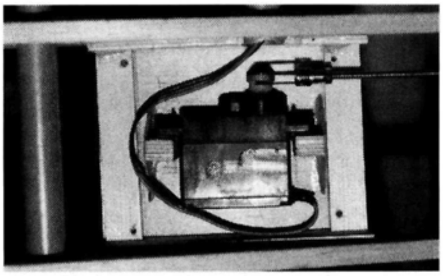
MAKE SLOTTED FLAPS



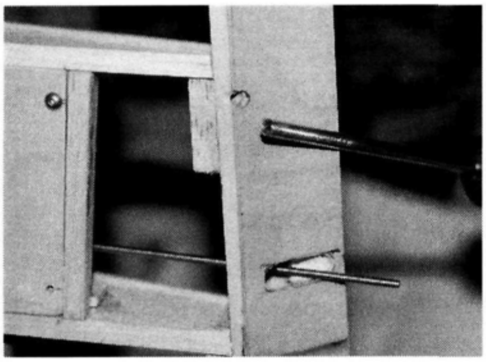
13 Using a block plane or a razor plane, carefully trim the edges of the plywood strip flush with the wing's top and bottom sheeting. Use the plywood's lamination lines as a guide to check that the edges are straight. When you are very close to the balsa sheeting, switch to sandpaper and a sanding block to produce a straight, precise edge.



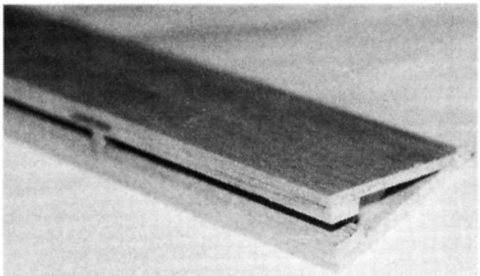
14 Flip the wing over, and glue balsa filler blocks into it in front of the flap cutout. Later, these will be drilled to form the sockets that accept the Robart Hinge Point hinges. With a fully sheeted wing, you'll have to plan the installation of these blocks early in the construction. They have to be in place before the plywood strips are glued into place.



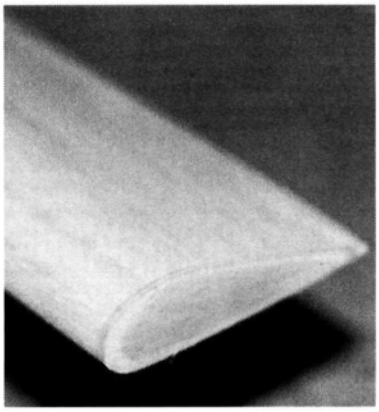
15 Now is a good time to make the hatch and install the servo for the flaps. I use a plywood hatch that fits into a recessed opening in the bottom of the wing. The servo is mounted on the hatch with plywood standoffs and screws. The pushrod is made of 4-40 threaded rod, locknuts and Du-Bro* steel clevises.



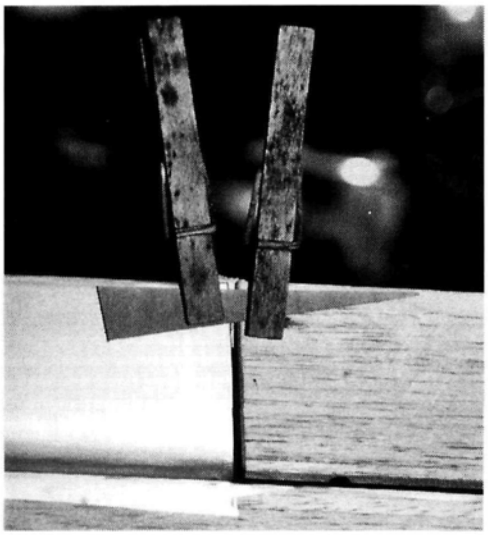
16 To drill the holes for the hinge points, I used a 4-inch-long brass tube sharpened at one end. Chucked in an electric drill, the tube cuts neat holes, but you can only drill about $\frac{1}{4}$ inch before you have to clean the balsa out of the end of the tube. Work slowly, and drill all the holes at the same angle relative to the wing's bottom surface. Next, cut out the slot for the flap pushrod. Round the ends of the slot as shown.



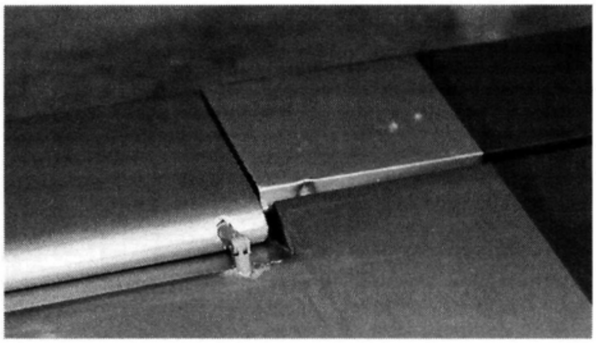
17 The flap is formed by using the trailing-edge section that was cut out of the wing earlier. Cut and sand the ends and the opening at the leading edge so that they're smooth and straight. Check frequently to see that the flap fits the cutout area of the wing properly. When the plywood endcaps are glued to the flap, there should be a clearance of approximately $\frac{3}{32}$ inch between each end of the flaps and the wing. To reinforce the hinges, fill the void between the upper and lower sheeting with balsa. Now glue a strip of $\frac{1}{2}$-inch-thick or $\frac{3}{8}$-inch-thick balsa sheet to the flap's leading edge, and cut, plane and sand the leading edge into a smooth, semisymmetrical radius.



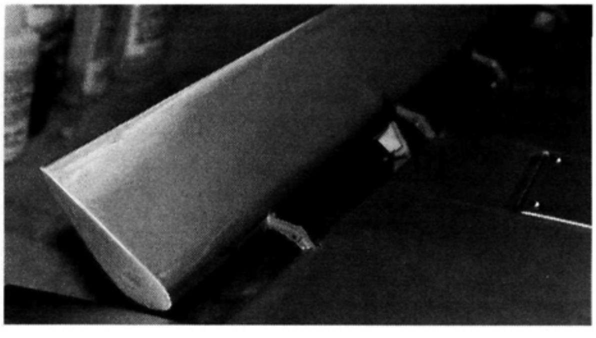
18 Cap the ends of the flap with $\frac{1}{16}$-inch-thick plywood, and sand them smooth. Make and install the flap-control arm as shown in the illustrations. Cut a slot in the flap's leading edge, and slide the control arm into place. It should line up with the pushrod slot that you cut earlier in the plywood trailing edge.



19 In the flap, drill the holes for the hinges, and cover the flap with finishing material. (I used Coverite's* 21st Century film.) The holes in the flap should precisely match the ones drilled in the wing. When you're satisfied that the flaps operate properly, cover the wing's trailing edge just in front of the flap. Using Elmer's carpenter glue, install the hinges so that the hinge pins are approximately $\frac{1}{2}$ inch below and $\frac{1}{8}$ inch in front of the flap's leading edge. Clamp the flap into place with clothespins, and let the glue dry.



20 When the glue has dried and the hinges are securely in place, connect the flap to the pushrod clevis and the rod to the servo, and secure them properly. Check the flap's operation, including its up and down positions, and finish covering your wing. With the flap in the up position, the slot formed between the wing and the flap should be closed.



21 In the down position, the flap should reach a maximum deflection angle of about 40 degrees. If the hinges are installed properly and the hinge pins all line up, the flap should operate freely without any binding. Now you're ready for some scale takeoffs and landings. Enjoy.

Scale, functional, slotted flaps add a lot to any model, and they're very easy to design and build. Taken one step at a time, they're no more difficult to build than any aileron you've made. Give slotted flaps a try; they work well and look great. ■

*Addresses are listed alphabetically in the Index of Manufacturers on page 138.

HOW TO

> *Editors' note: in response to the many requests we've received for information on this topic, in this issue, we've decided to include this chapter from Dave Gierke's definitive book, "2-Stroke Glow Engines for R/C Aircraft."*

SETTING THE IDLE

by C. DAVID GIERKE

A sound idle means safer landings

PROPERLY ADJUSTING a throttle carburetor for a glow engine can be frustrating. In a perfect world, the engine would idle for hours at 2,000rpm or less. When the throttle was opened wide it would never hesitate, cough, or quit in transition. Carburetors, however, have various combinations of high- and low-speed needle valves, idle-speed stop screws and air-bleed adjustments. Changes are occasionally required to compensate for a host of variables—such as a change in the weather!—that may be encountered.

Model airplane engine throttle carburetors have always been tricky, but after decades of experimentation and development, they're better than ever (Photo 1). This doesn't mean there aren't problems! Overlapping events within the 2-stroke engine's operating cycle have a tendency to undermine the idling efforts of the best carburetor.

The automotive industry has moved away from carburetors and their complicated mechanical systems in favor of microprocessor-controlled fuel-injection units. Sensors for throttle setting, engine speed, load, air flow, temperature and other parameters inform the computer of the instantaneous adjustments that are needed to keep the air-fuel mixture correct for all modes of operation. Economic and technical limitations suggest that an acceptable fuel-injector unit for miniature engines is years away; however, experimenters have taken important first steps toward developing the technology that may someday realize that goal. Unfortunately, the relatively crude and temperamental carburetor will be with us for the foreseeable future; you need to learn how to make it work.

1. An elementary barrel-type carburetor from the 1950s.

VARIABLES

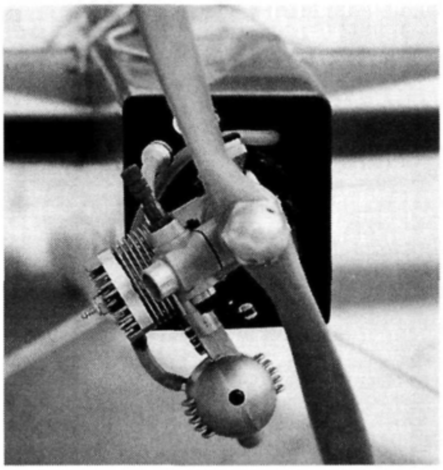
1. The distance between the fuel tank and the engine.
2. The vertical positioning of the tank in relation to the spray-bar jet hole.
3. The type of fuel used.
4. The propeller used.
5. The method of fuel delivery.
6. The glow plug used.

This list suggests that a poor idle may not be the carburetor's fault.

A Closer Look

• **Horizontal tank location**. The tank must be located as close to the engine and carburetor as is practical. Fuel-delivery problems are associated with the distance fuel has to travel against gravity when the nose of the model is raised. Known as *negative head pressure*, it works against atmospheric and muffler pressure systems.

• **Vertical tank location**. The center of the tank, viewed from the side, should be between ¼ and ½ inch *below* the center line of the high-speed needle valve (spray-bar jet hole). If the model doesn't allow this relationship to exist, *rotate the engine and mount* so that the spray-bar jet hole position is more favorably located to the tank center line (Photo 2). Sometimes, airplane designers fail to take this important measurement into account. This relationship provides the best compromise between having a full tank and having an almost empty tank.



2. The engine is rotated to align the carburetor spray-bar hole with the fuel-tank center line. Coincidentally, this perfectly aligns the engine's muffler and exhaust below the fuselage.

• **Fuel**. Fuel containing a small percentage of nitromethane (5 to 10 percent) will help to keep the glow plug lit. FAI fueled engines (no nitro) are notorious for their idling problems.

• **Flywheel effect.** Tiny lightweight propellers have difficulty providing rotating crankshaft momentum through an engine's operating cycle. This is one reason why high-speed racing engines don't idle very well. Conversely, large-diameter propellers with heavy spinner assemblies help to provide *flywheel effect* and superior idling characteristics.

• **Fuel-delivery systems**. 1. *Suction feed* isn't what you think it is! *Atmospheric pressure* makes the system work. The carburetor venturi and the engine's crankcase together produce a partial vacuum at the carburetor spray-bar jet. The difference in pressure between the atmosphere acting upon fuel in the tank and the low pressure at the carburetor causes fuel to flow (Figure 1). Unfortunately, as the engine

slows to idle, so does air flow through the carburetor; the partial vacuum is weakened, and fuel delivery slows, usually producing a lean mixture.

2. *Muffler pressure* provides a higher fuel-delivery force because it operates above atmospheric pressure (Figure 2). Therefore, fuel delivery doesn't depend as heavily on the partial vacuum generated at the carburetor venturi. It's like blowing a pea through a soda straw: the higher the pressure, the more positive the delivery! The increased fuel pressure usually provides a rich mixture at idle speeds.

Note: advanced fuel-delivery systems, including *tuned-pipe pressure, crankcase pressure* and *pumps,* have advantages and disadvantages. For simplicity, I'll restrict my discussion of carburetor adjustments to the popular *muffler-pressure* method.

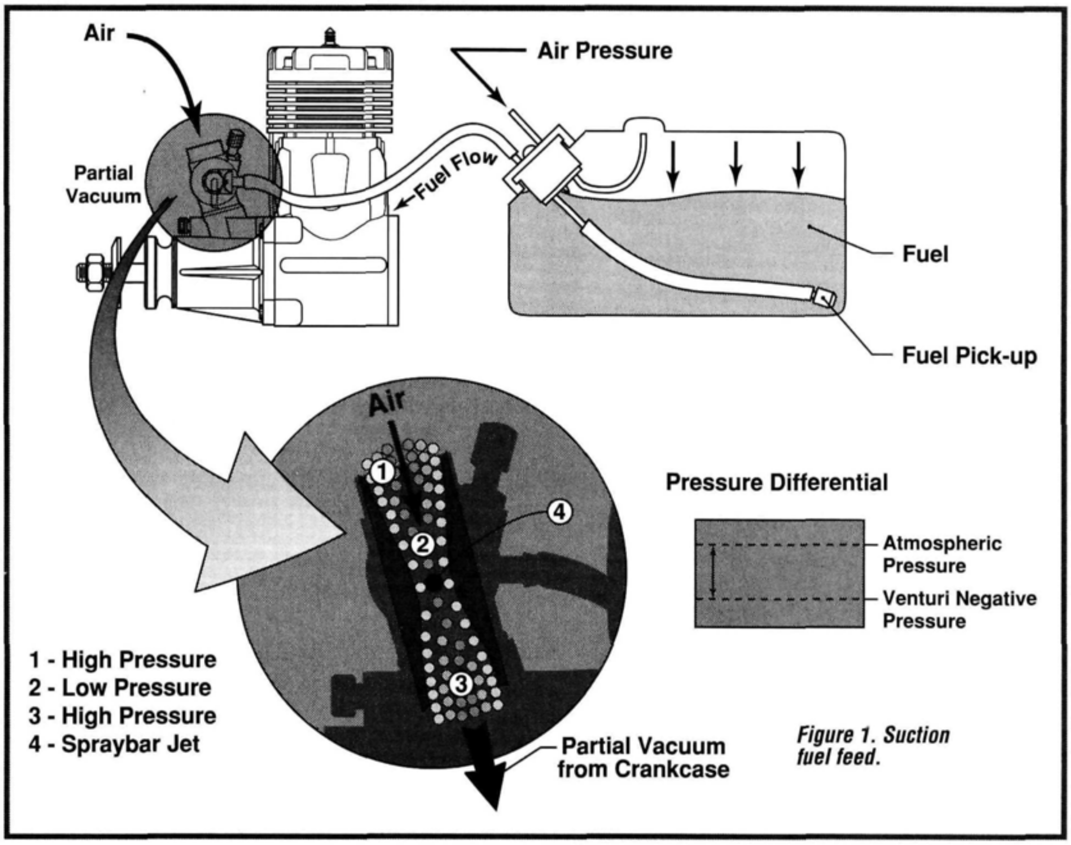


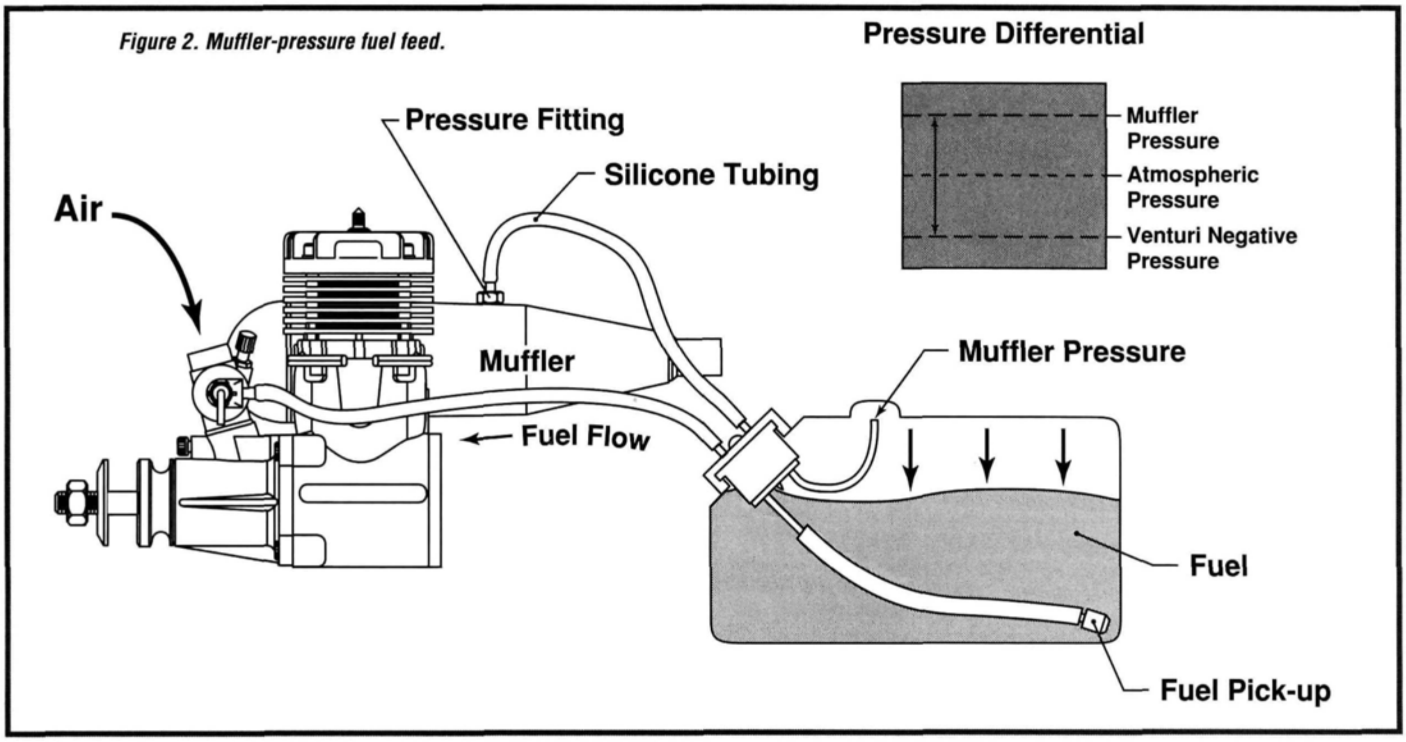
Figure 1. Suction fuel feed.

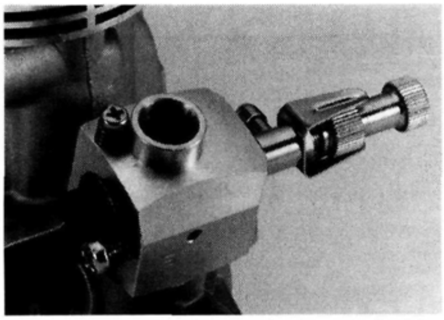
• **Glow plugs.** Glow plugs play a significant role in an engine's ability to maintain an idle. If an engine is idling with an overly rich setting, it will have a tendency to *load up*. This refers to a puddle of raw fuel in the engine's crankcase. When the throttle is opened, the rush of air into the venturi causes the accumulated fuel to rush through the bypass passages and transfer ports and into the combustion chamber, extinguishing the glow plug. Installing a hotter (referring to its heat range) plug, or one that has an idle bar will occasionally cure the problem. The idle bar is designed to deflect some of the raw fuel away from the plug coil (element), thus preserving ignition. Ultimately, the solution depends on leaning the idle mixture.

THROTTLE CARBURETOR TYPES

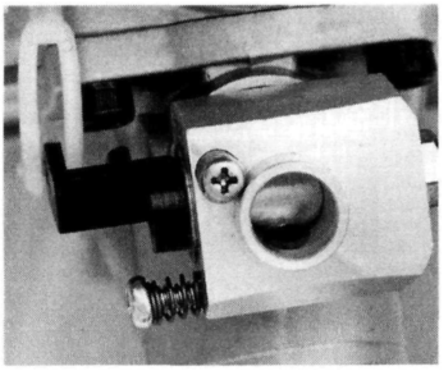
My purpose here isn't to analyze the operation of throttle carburetors. My objective is to identify carburetor types and learn how to adjust them properly. We've already identified some of the variables that affect their operation, so let's look at carburetor identification.

Figure 2. Muffler-pressure fuel feed.





3. The air-bleed carburetor is characterized by the small hole at the front of the body that bleeds air into the engine at idle.



4. At full idle, the throttle barrel remains open about 1⁄32 inch.

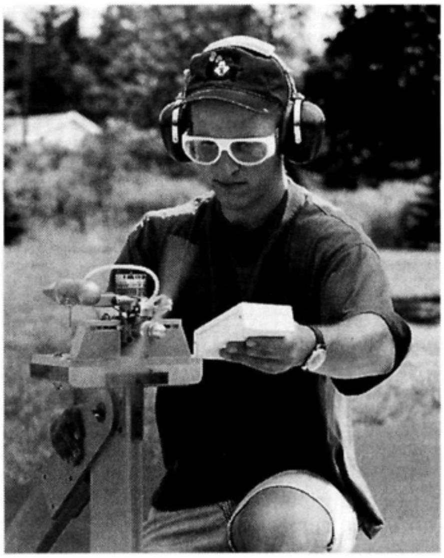
• **Air-bleed throttle carburetors**. The idle is set by *metering the air* in the system. Certain models of Enya, Fox, Irvine, O.S. and Thunder Tiger use this type of throttle carburetor. As the throttle barrel is closed, the air-bleed hole (which is visible on the front of the carburetor body) opens to the inside of the venturi, providing additional air that is controlled by the idle-mixture adjustment screw (Photo 3).

Review your setup:
Assuming that the engine is still mounted on the test stand at the end of break-in, review the following:
a. Photo 4: identify the idle-mixture screw (arrow no. 1) and the idle-speed stop screw (no. 2).
b. Check that the *idle-speed stop screw* has limited the barrel closure to a small opening of about 1⁄32 inch (Photo 4).
c. Inspect and adjust the tank's vertical position (described earlier).
d. Install the propeller and safety nut or spinner that you plan to use for flying (Photo 5).
e. Install a *new* glow plug in place of the one used for break-in; this will ensure that an altered plug (through its use) will not influence your initial setup. Keep the used plug as a backup.

Adjustment procedure:
1. Set the throttle to wide open and start the engine.
2. Adjust the high-speed needle valve to slightly richer than peak rpm.
3. Pull the throttle rod back slowly until the carburetor barrel rotates to the preset stop point. If the engine continues to idle, it should be in the 2,500 to 3,500rpm range.
4. After 10 to 15 seconds, push the throttle rod back toward wide open. If the engine spits and sputters while belching raw fuel out the exhaust, it's *loaded* and the idle setting is *too rich*. To be safe, air-bleed adjustments should be made with the engine turned off. If the engine hasn't already quit, pinch the fuel line. The *idle-mixture screw* operates in a way that's the opposite of most needle valves that control fuel flow (Photo 6). When the air screw is *turned out*, or *opened* (counterclockwise, viewed from the end of the screw), the idle mixture is *leaned*. When it's *turned in*, or *closed* (clockwise), the amount of air allowed to bleed into the venturi is reduced, and the mixture is *richened*.
5. Turn the screw out *1⁄4 turn* and restart the engine.

Note: all adjustments should be made in 1⁄4-turn increments.

6. Throttle the engine back to full idle and run through the procedures described in steps 3 and 4. If the engine speeds up slightly when the throttle is advanced but sounds *choked* and quits (or simply quits abruptly), the idle mixture needs to be richened.



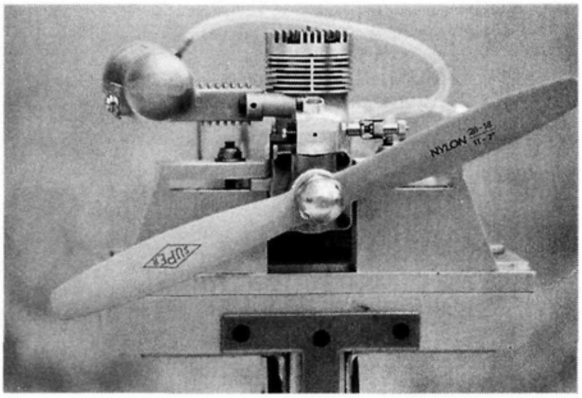
7. Checking the idle rpm with a tachometer, from behind the engine. Notice the safety glasses and hearing protection.

To make these adjustments, you'll have to stop and start the engine several times. When the engine smoothly accelerates through the transition range, you're getting close to the correct idle setting.
7. At this point, return to wide-open throttle and check that the high speed mixture hasn't changed. Readjust if necessary.
8. Return to idle; now adjust the *idle-speed stop screw* to the lowest reliable rpm. An idle from 2,500 to 2,700rpm is acceptable for 2-stroke glow-ignition engines (Photo 7).

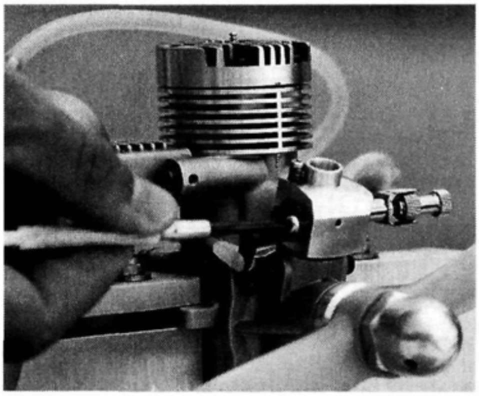
Remember: it's better to have an engine that idles reliably at 2,800rpm than one that quits occasionally at 2,500rpm!

• **Two-needle (TN) throttle carburetors**. A TN carburetor's idle is set by metering the fuel in the system with the low-speed needle valve (Photo 8); many models of ASP, Enya, Fox, HP, Irvine, Merco, O.S., NovaRossi, SuperTigre, Thunder Tiger, TSI, and Webra engines use this adjustment system. (For the addresses of the manufacturers/distributors of these engines, see the Index of Manufacturers later in this issue.)

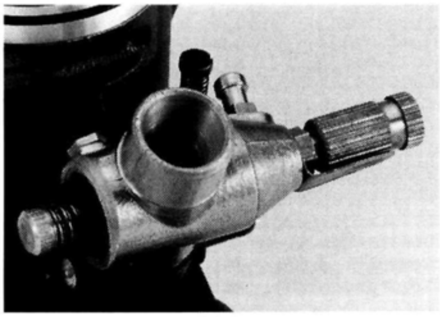
TN throttle carburetors control the idle mixture with an adjustable, secondary (low-speed) needle valve. As the throttle barrel is closed, it also moves laterally toward the stationary spray-bar jet, taking with it a secondary needle valve that gradually enters the spray-bar-jet orifice; this leans the idle mixture. Many modelers believe



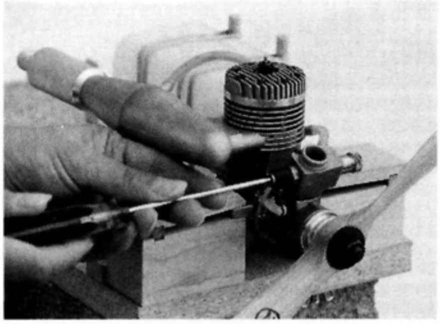
5. When setting the idle, always use the propeller you intend to fly on the model.



6. Adjust the air-bleed screw with the engine turned off.



8. The two-needle (TN) carburetor is characterized by a second (usually smaller) needle valve or screw that's directly opposite the primary needle valve.



9. Adjusting the secondary needle-valve screw with the engine off. Don't burn your finger on the hot muffler!

that the TN system provides a more accurate control of the process and gives a faster throttle response through the intermediate range. This may be true, because TN-type carburetors are more sensitive to being adjusted.

Adjustment procedure:
Steps 1 through 4. Follow the steps as you did with the air-bleed carburetor. For rich mixtures, however, turn the idle-mixture needle valve in a clockwise direction to lean (viewed from the end of the needle). Because TN carburetors such as the Webra's have an actual secondary needle valve, the engine need not be stopped to make the ¼-turn adjustments. In other cases, as with the SuperTigre TN carburetor, a slot-head screw replaces the needle valve. With these, *the engine should be stopped before engaging a potentially dangerous screwdriver this close to the rotating propeller* (Photo 9). Of course, if you must richen the mixture, turn the idle-mixture needle valve counterclockwise.

All other adjustments and checks are the same as with the air-bleed throttle carburetor.

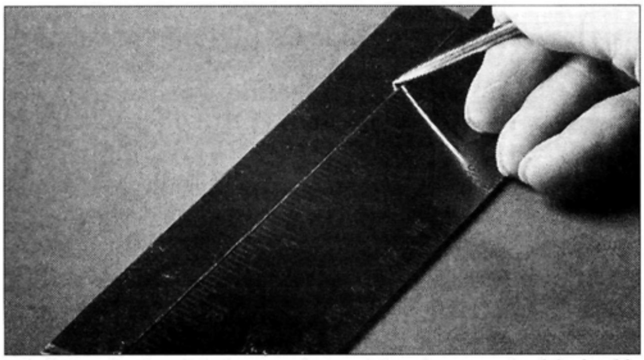
The importance of a reliable idle can't be over-emphasized. One of the most precarious times during an R/C flight is the landing sequence; and it's here that a dependable idle can make all the difference between a safe approach and one that ends in a dead-stick disaster. ■

HOW TO:

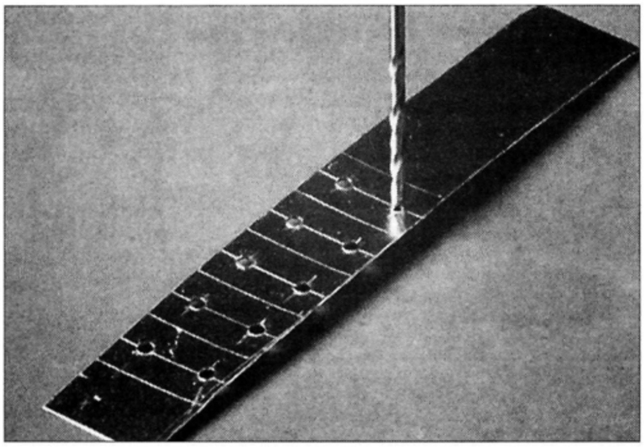
RANDY RANDOLPH

MAKE CUSTOM LANDING-GEAR CLIPS

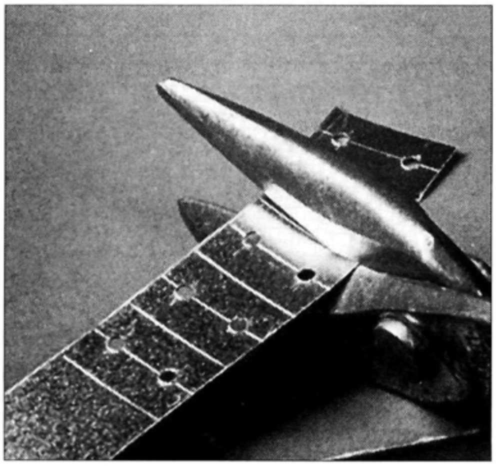
Torsion-bar landing gear is standard equipment on almost all wing-mounted setups. To mount this type of gear externally, just drill a hole in the plywood plate and install landing-gear clips that match the size of the wire that's used for the gear. Clips are available to fit common wire sizes, but often, it's hard to find the right size. Here's how to make landing-gear clips for any installation.



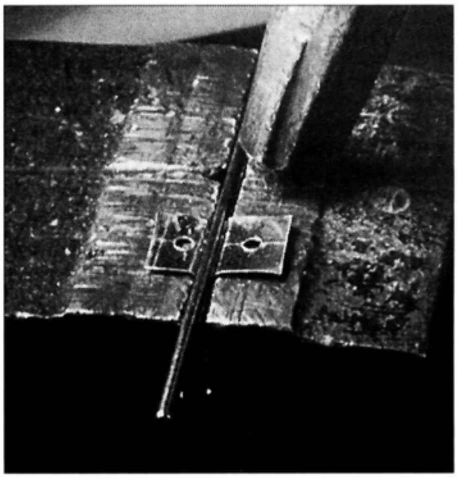
1 ***Using sheet-metal shears or heavy-duty scissors, cut a 1-inch-wide strip from the side of a tin can. Mark off ¼-inch strips with a scribe.***



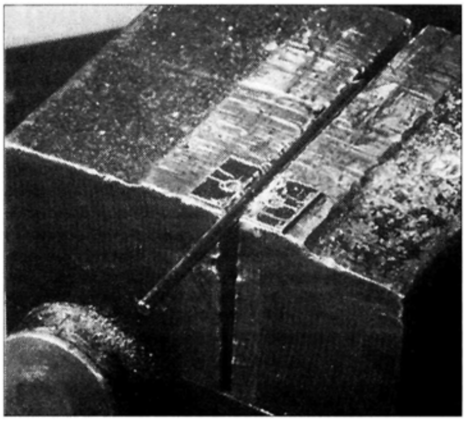
2 ***On every other line, measure ⅛ inch from each end of the strip. Mark the holes with a center punch or scribe, then drill 3⁄32-inch holes.***



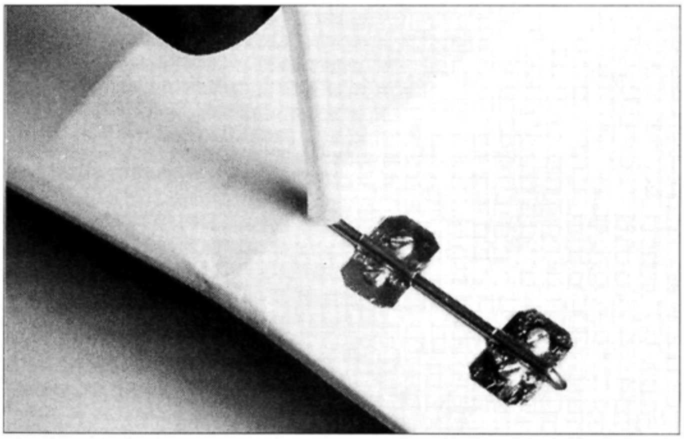
3 ***Cut the clips along the lines as shown. You now have clips that are 1 inch long and ½ inch wide with holes that are ¾ inch apart.***



4 ***Open your vise jaws to about 1⁄32 inch wider than the width of the landing-gear wire. Center the clip over the opening between the jaws, then lay the wire on the clip directly over the opening. Use a hammer to shape the clip.***



5 ***Flatten the wire and the clip so that they're flush with the vise jaws. Two hardwood blocks can be substituted for the vise and will work equally well (possibly even better). A minimum of two clips is necessary for each landing-gear leg.***



PHOTOS BY RANDY RANDOLPH

6 ***Round off the square edges of the clips. If the wire is larger than ⅛ inch in diameter, the clips should be at least ¾ inch wide.*** ■

FIELD & BENCH REVIEW

SIG MANUFACTURING TRI-STAR

by JIM SIMPSON

Versatile canard for electric, glow, or slope flying

ARE YOU AN ARC'er who's stuck in a rut? Do you dream of having an unusual, futuristic-looking, exciting, different kind of plane? Well, look no further, because this Sig Mfg.* Tri-Star will quicken your pulse and draw everyone's attention.

Chances are, you've never seen a canard fly—a plane with the big wing in back and the horizontal stab in front. Surely you know they do. The XB-70 flew and, nowadays, many home-built canards fly. How well Sig's model flies depends on how well you follow instructions and pay attention to details.

To be totally fair in this evaluation, we flew the Tri-Star with both gas and electric power and as a slope soarer. I'll try to differentiate among these as I go.

CONSTRUCTION

You just haven't lived until you've used laser-cut parts. The fit is so good that glue is almost an afterthought. This is an easy kit to build, and it's worth your while to follow the manual even if you're an experienced builder.

The wing fins and the canard are sheet-balsa parts and need only to be edge-glued and sanded to shape. The wing is foam-core that's partially covered with 1/32-inch-thick sheet balsa. In addition to 3M 77 spray contact adhesive and Sig Bond glue, you may want to consider double-sided tape or Satellite City* UFO-style CA glue with "Kick-It" accelerator, which is what I used and which made the wing assembly a real breeze! Satellite City UFO works well on foam.

The fuselage sides are ply doublers on balsa, and the entire assembly goes together very quickly because everything fits so well. One of the construction photos shows how to modify the nose gear so that it's removable; that way you can fly all three versions. Otherwise, build the model to suit your intended mission. A neat feature of the instruction manual is full-size templates in the center section.

The last two pages of the manual

SPECIFICATIONS

Model name: Sig Tri-Star

Type: R/C sport canard

Manufacturer: Sig Mfg. Co.

List price: $69.95

Wingspan: 47.5 in.

Wing area: 420 sq. in.

Weight: 18 to 46 oz.

Wing loading: 11 to 14 oz./sq. ft.

Airfoil type: semisymmetrical

Length: 35 in.

Req'd motor/engine size: .09 to .15 glow; 05 can or cobalt electric

Engine used: Cox .09 R/C; Astro FAI 05 Cobalt electric

Prop used: 7x4—glow; 8x4—electric

No. of channels req'd: 3 (elevator, throttle, aileron)

Wing construction: partially sheeted foam-core

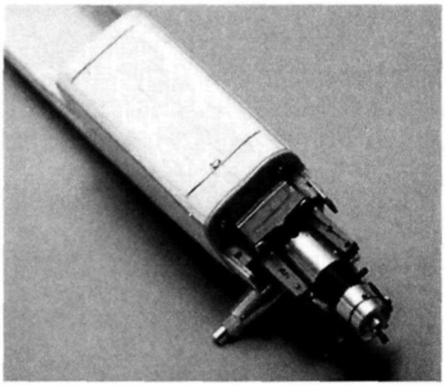
Fuselage construction: balsa/ply built up

Features: CAD-drawn, full-size plans; foam-core wings; laser-cut parts; formed canopy, belly pan and tail cone; complete hardware package; Sig EZ Hinges; three large decal layouts; photo/illustrated instruction book.

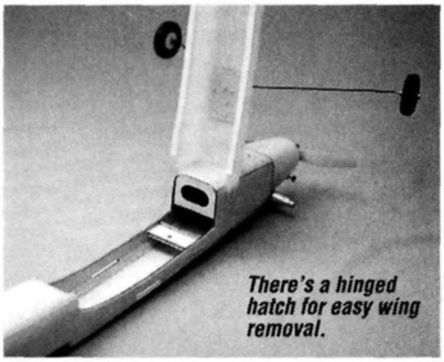
Hits
- Unique design.
- Jet-fighter appearance.
- Can be flown with gas engine, electric motor, or as a slope soarer.

Misses
- Difficult for beginners to fly.
- Difficult CG placement.

PHOTOS BY JIM SIMPSON; COLOR PHOTOS BY DAN PARSONS



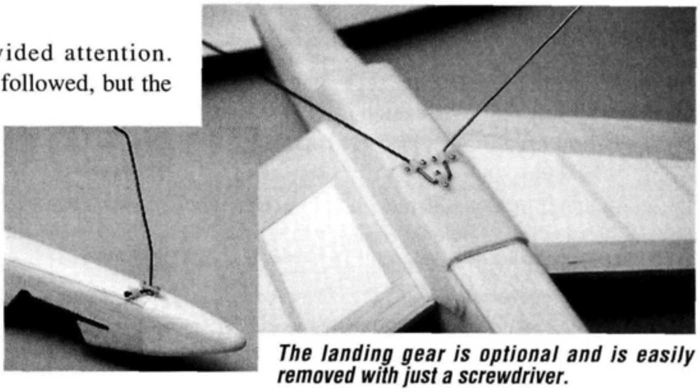
The Cox .09 R/C engine in the Sig Tri-Star airplane.



There's a hinged hatch for easy wing removal.

deserve your undivided attention. Every step should be followed, but the bold print and heavy type mean don't even *think* about skipping that step! To balance the plane properly, I mounted a small eyebolt screw in a plywood doubler on top of the fuselage so I could hang the plane on a straightened coat hanger. Because I hate to add lead to balance a plane, I re-configured the battery pack so that I'd have two side-by-side cells with one pair behind the other. Then I could slide it all the way forward under the stab in the bottom of the fuselage and—voilà!—no need for nose weight when flying either of the power versions. For slope-soaring, I took it out and put a regular 4-cell rectangular pack in the tail cone.

During the balance test, I moved the balance point five times and discovered that the plane flies best with the balance point 8⅜ inches ahead of the firewall and with the trailing edge of the canard ⅜ inch below neutral. Yes, the two are related!



The landing gear is optional and is easily removed with just a screwdriver.

POWER

For the gas-powered version, I mounted the throttle servo on the bottom surface of the wing so that it was inside the belly pan and centered on the balance point. When I switched to electric power, I simply removed the servo and used Velcro™-brand fastener to hold the 7-cell battery pack in

FLIGHT PERFORMANCE

I've noticed that kit reviewers often have other people fly their planes. Because I wanted to be more objective with the three phases of flight evaluation, I asked my good friend Taylor Collins to give me a hand. It was easy to get him to do almost all the flying, which he does very well. We also spent a lot of time discussing our observations.

• Takeoff

We began the testing with a brand-new, out-of-the-box Cox* .09 R/C engine. A couple of tanks of 15-percent nitro and the attendant needle tweaking and restarts preceded the first takeoff attempt. There wasn't enough power, so we returned to the pits to increase the nitro content. Removing the head gasket and the muffler helped. Gradually increasing the nitro to 25 percent, 35 percent and finally 45 percent yielded 13,800rpm on a 7x4 Zinger* prop. That got the plane airborne after a takeoff run that was similar to the takeoff of a full-size jet—a couple hundred feet on pavement and a slow climb rate. Don't attempt crosswind takeoffs until you've flown the plane several times and it's all trimmed out. We removed the landing gear for the electric and slope flights and used hand launches.

• Landing

Landings with the Tri-Star are not, by any means, automatic with the landing gear installed. The nose gear is long, and all the struts are relatively "spindly" (which isn't necessarily bad—just different), so it takes some effort to "paint it on"; but when you do, there comes a sense of accomplishment. *[Editor's note: the manufacturer has since increased the landing-gear wire to ⅛ inch to reduce flexibility.]* When hand launches were used, landings varied widely (from skidding belly landings to plops in the bushes). Because it has a molded-plastic belly pan to land on, the only post-flight, landing-induced maintenance that was required was pouring the sand out of the air-cooling inlet on the front of the pan.

• High-speed performance

We discovered during the first days of test flights that the Cox .09 was only marginal at our altitude, which is more than 1 mile above sea level. Needless to say, we didn't achieve high-speed flight with this setup. The plane was stable in level flight. Larry Renger at Cox assured us that the engine was performing at its best, so it's safe to say that a .15 would be a better choice at higher altitudes, although the .09 would do fine at sea level.

We were pleasantly surprised when we installed the Astro Flight* 05 FAI Cobalt electric motor with an 8x4 plastic prop and a 7-cell 1500mAh battery pack. The plane flew very well, and its climb rate was at least doubled. *[Editor's note: this is because an electric motor doesn't need a fuel/air mixture to run; so the motor performance would be better.]* Even so, with this combination, we were able to loop and roll at will. I found that the elevator is too sensitive in the slope-soaring mode, so you should use dual rates if you have them.

• Low-speed performance

It took us a while to realize that the tendency to Dutch roll was not so much a reaction to a poorly placed CG or surface deflection as just flying too slowly. Apparently, the plane tries to snap roll, but at low speeds there's not enough inertia to turn it over. The incidence relation between the wing and the forward stab prevents this. When flown faster (as with the electric motor and on the slope with a good breeze), there's no Dutch roll, and it's a pleasure to fly.

• Aerobatics

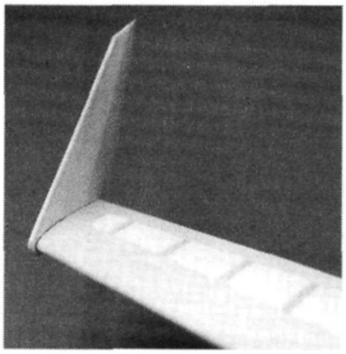
Loops and rolls were the order of the day with the electric mode and on the slope (and would be with a .15 motor at high elevations or a .09 at sea level). We also discovered that, when rolling, as the plane slows way down, a really spiffy snap roll will end the sequence. We weren't able to achieve sustained inverted flight because the plane would continue to roll until it was upright. Half loops to inverted became Immelmann turns, and I chickened out on a half outside loop to inverted flight because it tried to "tuck under"! When we performed stunts with the electric motor, we noticed that the foam wing buckled a little owing to the high G-loads.

the molded plastic belly pan. For slope soaring, I simply removed them both.

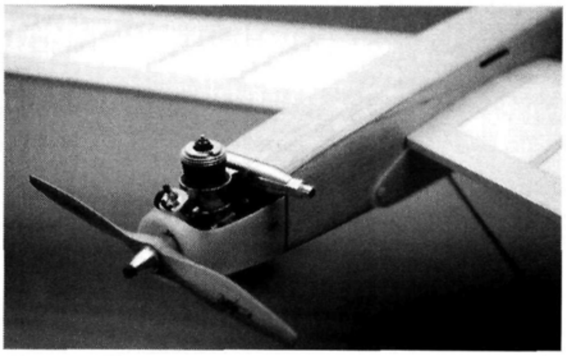
The radio I used for this project was one of my Micro Pro 8000s. No, I didn't need the computer function. In fact, if you fly gas or electric, any 3-channel radio will do, and two channels will slope it all day long. With the way servo leads plug into the Pro 810 receiver, equipment installation was a snap.

FINISHING

I covered the entire plane with white MonoKote* and used the kit decals to doll it up. Then I spray painted the inside of the canopy with black paint. The plastic belly pan and tail cone are bone colored, so you can leave them unpainted or spray paint them with gloss white.



The vertical winglets are made of sheet balsa.



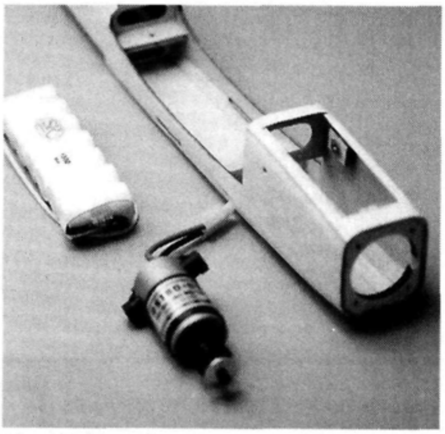
You must file a notch in the muffler ring to mount the Cox .09 R/C engine as shown.

Because of this removable hatch, access to the Tri-Star's radio area is easy.

FUN TO FLY

The Sig Tri-Star is a fun 2- to 3-channel plane that can be flown in a variety of ways. We explored three of them and found the electric and the slope-soaring versions to be the best. At sea level, however, with the right internal combustion engine, the same results can be achieved. Enjoy this unique design, but be careful not to overstress the wing. Good luck and happy flying!

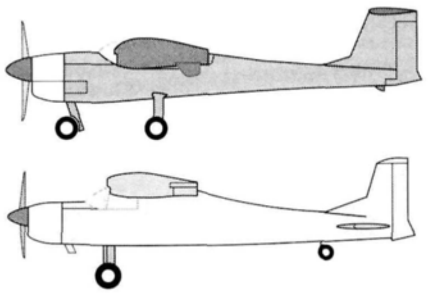
**Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■



The Tri-Star offers three propulsion methods: no-motor, slope-soaring glider; Astro 05 (or equivalent) electric; and Cox .09 glow engine.

HOW TO

Horizontal Tail Incidence and Downwash Estimating



Efficient wing/tail relationships

by ANDY LENNON

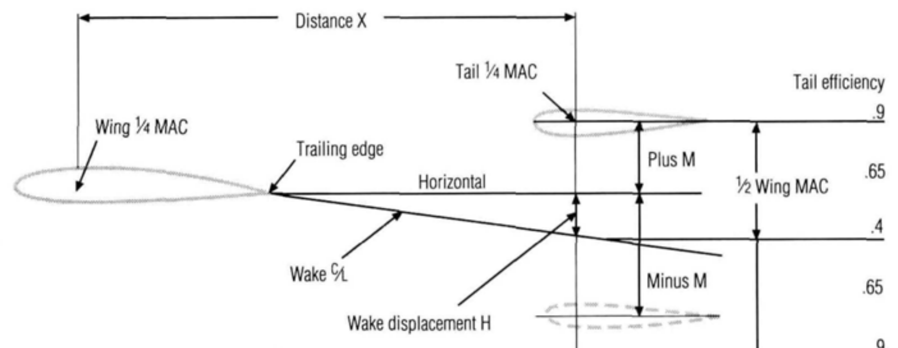


Figure 1. Wake and downwash determination.

PHOTOS BY ANDY LENNON

AN AIRPLANE in level flight at its selected cruising speed is a classic balancing act. To achieve this balance, both nose-down and nose-up moments must be evaluated. The horizontal tail must balance the net result of these moments. (A moment is simply a weight or force multiplied by a distance—also called "arm"). The horizontal tail's angle of attack, *relative to the wing's downwash*, should be sufficient to provide the upward, or most often, the downward lift required to provide this equilibrium.

The penalty for having an incorrect tail incidence is heavy elevator deflection at cruise speed. This adds drag and could result in a lack of adequate elevator authority to bring the airplane to a near-stall landing posture while in ground effect, with full flap deflection and with a CG located ahead of the wing's aerodynamic lift center.

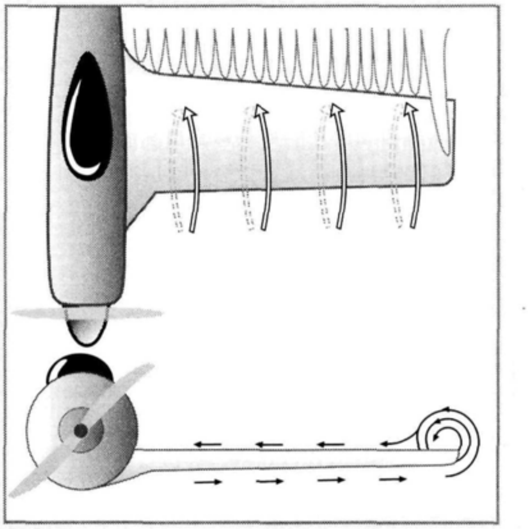
Establishing the appropriate tail incidence calls for:

- an evaluation of the moments, in inch-ounces, both nose-up and nose-down to obtain the *net* result. Nose-up moments are offset by nose-down moments;
- a determination of which type of tail lift—upward or downward—in ounces is required to provide the balancing moment at the model's selected cruising speed;
- a calculation of the tail angle of attack required to provide this tail lift;
- an estimate of the downwash angle at the horizontal tail's location;
- setting the tail's incidence, relative to the downwash at the calculated angle of attack to provide the balancing moment.

Vertical Location of the Horizontal Tail

In addition to the downward deflection of the air by the wing that results from its production of lift, both profile and induced drags "pull" the air along with the wing, so that by the time it reaches the tail, it has lost some of its velocity. (This is easier to visualize if one considers the airplane fixed with the air passing at level flight speed, as in a wind tunnel.) This reduction adversely affects the tail's effectiveness.

The greater the vertical distance between the wing's wake and the horizontal tail, the smaller (flatter) the downwash angle is and the less the reduction in air velocity is. A T-tail location, atop the vertical tail surface, raises it well above the wing's wake and puts it in less disturbed air.



How air flows past a wing. As air flows past a wing from leading edge to trailing edge, positive pressure is created below the wing, while negative pressure exists above. At the wingtip, the positive-pressure bottom-wing air flows around the tip and is drawn into the negative-pressure region above the wing. This action gives rise to the wingtip vortex, as well as to lesser vortices along the trailing edge.

MOMENT EVALUATION

The following details the four major moment sources. There are others, which are beyond the scope of this article, but small elevator trim adjustments would compensate for their minor values.

- **CG location.** A CG that's *ahead of* the wing's ¼ MAC (mean aerodynamic chord) causes a nose-down, or negative moment. Its value is the horizontal distance between the CG and ¼ MAC, in inches, multiplied by the model's gross weight in ounces. Having the CG behind the wing's ¼ MAC causes a positive or nose-up moment. Its value is calculated in the same way as for a forward CG, but it has positive value. In level flight, a CG that's vertically in line

with the wing's lift (at ¼ MAC) contributes neither up moment nor down moment.

• **Airfoil pitching moment.** Symmetrical sections have no pitching moment; semisymmetrical and flat-bottom airfoils have such moments, which are always negative or nose-down. Their value is calculated using Formula 10 (pitching moment) in "Airfoil Selection, Part 2," *Model Airplane News*, June 1992.

• **The wing's drag moment.** The wing's total of both profile and induced drags, in ounces, at the wing's angle of attack for the design cruising speed, is calculated using Formulas 5 ("Total of profile [section] and induced drag coefficients") and 9 ("Total profile and induced wing drag"), also in Part 2 of "Airfoil Selection."

The drag moment is the drag in ounces multiplied by the vertical distance, in inches, between the CG and the wing's ¼ MAC on the airfoil's chord line. If the wing is below the CG, the moment is nose-down, or negative. If it's above the CG, the moment is nose-up, or positive. If the wing is *on* the CG, it contributes *no* drag pitching moment.

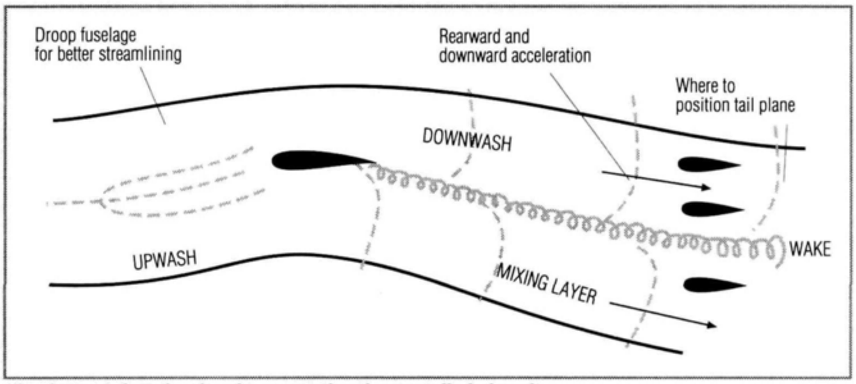
• **Thrust moment.** A thrust line above the CG promotes a nose-down (negative) moment. Below the CG, the moment is nose-up (positive). The thrust, in ounces, is difficult to pin down without a wind-tunnel test. An educated guess is a thrust of 40 percent of the model's weight for level flight at the design cruise speed. The moment, in inch-ounces, is the estimated thrust multiplied by the vertical distance in inches from thrust line to CG. If the thrust line passes through the CG, there is no thrust pitching moment.

• **Net result.** The net sum of these four moment sources will provide the balancing moment that the horizontal tail plane must provide. Usually, the net result is a nose-down, or negative figure.

TAIL-LIFT NEEDED

Dividing the net moment figure given in the previous section by the tail's lever (or tail moment arm—the distance from CG to the tail's ¼ MAC in inches) will tell how much lift, in ounces, the tail must develop to provide the balance moment. If the net moment is negative, or nose-down, the tail must lift downward. If positive, the tail lift must be upward.

Wake and Downwash



The downwash and wake of a conventional, rear-tailed aircraft.

The tail surfaces of a conventional, rear-tailed airplane operate in a very disturbed atmosphere. As the figure illustrates, the air sweeps downward off the wing's trailing edge as the result of the lift generated. This air stream is called the "wake." This wake is turbulent, and it influences the air—both above and below itself—in a downward direction called "downwash."

Obviously, no self-respecting horizontal tail should find itself in this very disturbed wake.

The downwash angle depends on the lift coefficient at which the wing is flying. An airplane has many level flight speeds, from just above the stall at low engine rpm to its maximum speed at full throttle. At low speeds, the wing's angle of attack increases, as does its lift coefficient, and the downwash angle is high. At top speed, the reverse is true, and the downwash angle is low.

At low speeds, the horizontal tail's downward lift must be increased to force the wing's airfoil to a higher angle of attack. Part of this download is supplied by the increase in the downwash angle. At high speeds, the tail's download must be reduced to lower the wing's angle of attack; but again, because the downwash angle is reduced, the tail download is reduced.

The point of all this is that as the model's level flight speed varies with the throttle setting from low to high—or vice versa—the horizontal tail's lift must vary accordingly. On model airplanes, this is accomplished by changing the angle of the elevators. This angle is controlled by the elevator trim lever on the transmitter—literally at one's fingertips (a little up-elevator at low speeds and some down for high speeds).

The angle of incidence of the fixed part of the horizontal tail, i.e., the stabilizer, is important, but not too critical. For semisymmetrical or flat-bottom-wing airfoils, an angle of incidence of minus 1 degree (as measured against the datum line) is appropriate. For symmetrical-wing airfoils, an angle of incidence of 0 degrees is suggested. (There are some exceptions to these rules.)

TAIL ANGLE OF INCIDENCE

The tail lift required, in ounces, should be adjusted to compensate for the tail's efficiency (or lack thereof). See Figure 1. That adjustment would be: lift required divided by tail efficiency. For a T-tail where the lift required is 100 ounces, this would increase to 100 divided by 0.9, or 111 ounces.

To calculate the tail angle of attack needed to provide that lift, use Formula 7 ("Lift coefficient required"; special procedure A: "Lift coefficient per degree angle of attack adjusted for aspect ratio and planform" and special procedure B: "Angle of attack (or incidence) for level flight" (*Model Airplane News*, June 1992). Identify whether the angle is positive (upward lift) or negative (downward lift).

DOWNWASH ANGLE ESTIMATING

The first step is to determine the location of the wake center line at the tail (Figure 1) so as to obtain the wake displacement "H." With H and two other dimensions from your drawings, plus (or minus) M and distance X, you can easily locate the wake center line relative to the tail.

• **Wake center line.** Factors controlling the wake displacement are

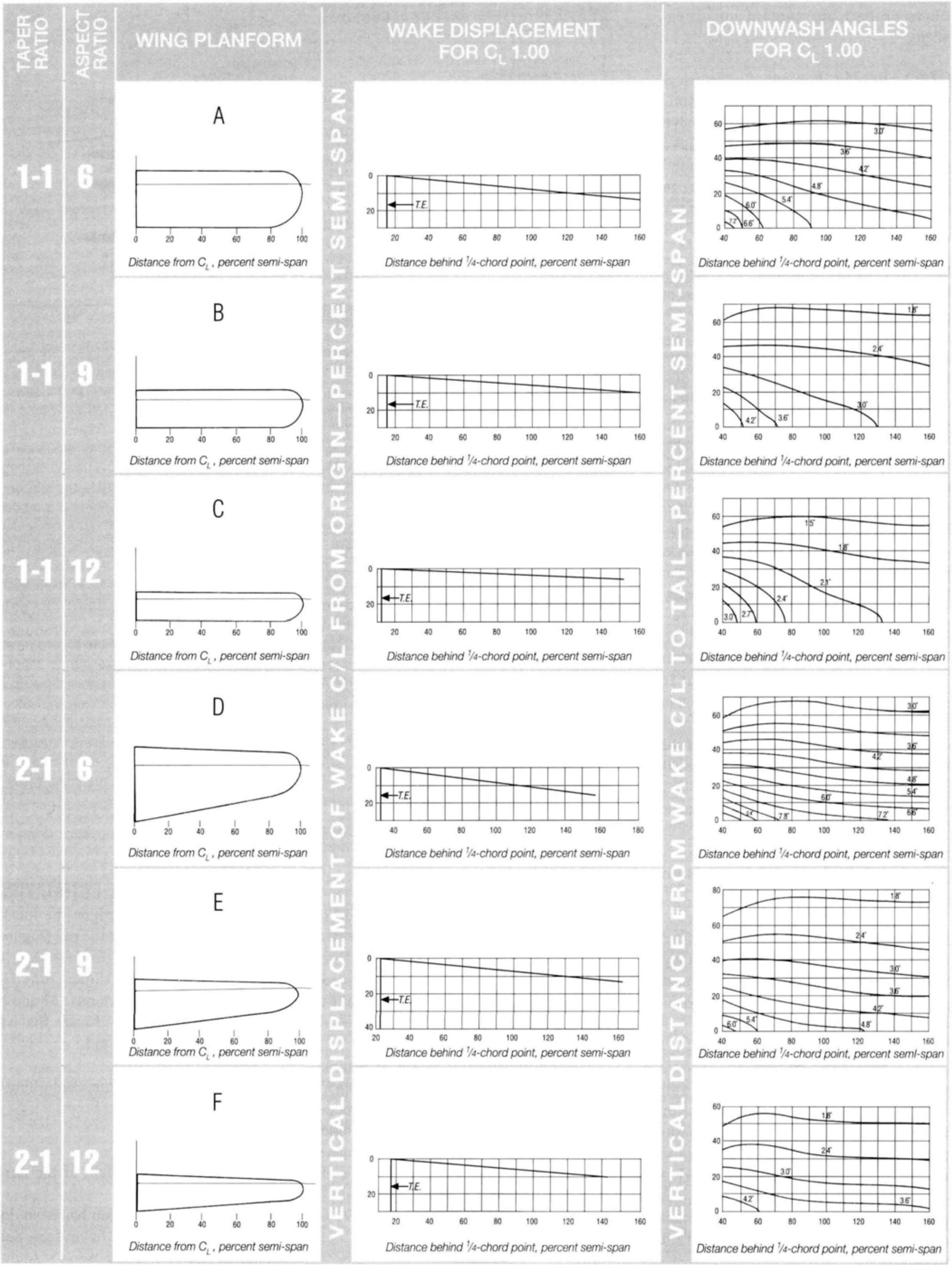
—wing aspect ratio;

—wing planform;

—wing's lift coefficient at the design cruising speed.

If a thorough design job has been done, the lift coefficient will have been determined in calculating the wing's angle of incidence for level flight ("Estimating level

A to F Wake Displacement and Downwash Angles (Fig. 2)



flight speeds," February 1994 issue).

Refer to Figure 2, A to F. This was extracted from NACA report 648 and is not difficult to use. First, note that all the dimensions are given as a percentage of the wing's semi-span.

• The column on the left covers the wing planforms, both straight and tapered, for aspect ratios of 6, 9 and 12. Dihedral and sweepback may be ignored. Select the planform closest to your design.

• The center column provides the wake displacement for each of the planforms *for a lift coefficient of 1.00*. Note the decrease with increasing aspect ratio. If your wingspan is 60 inches, the semi-span is 30 inches. If distance X in Figure 1 equals 24 inches, then wake displacement is 24 divided by 30, or 80 percent of the semi-span. In the center column, Figure 2A, the wake displacement at 80 percent of semi-span is 8 percent of the semi-span, for a lift coefficient (C_L) of 1.00. If your wing's C_L is, say 0.3, this displacement would be reduced to 0.3 multiplied by 8, or 2.4 percent of the semi-span and is distance H in Figure 1.

Now convert distance M into a percentage of the wing's semi-span. If, for your design, M equals 4 inches, wake displacement is 4 divided by 30, or 13.3 percent of semi-span. Note that M is negative for tails below the wake center line.

Adding distances H and M gives the vertical location of the horizontal tail relative to the wake C_L. In our example, H plus M, 2.4 percent plus 13.3 percent is a total of 15.7 percent, and distance X is 80 percent of the wing semi-span.

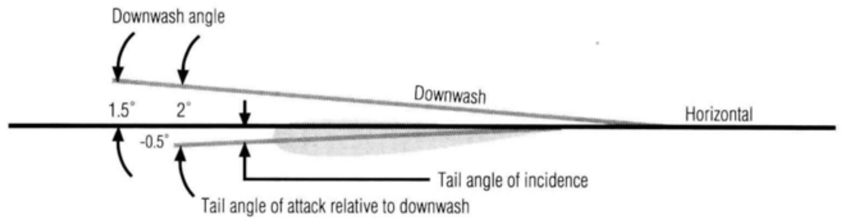


Figure 3. Tail-plane angle of incidence.

DOWNWASH ANGLE

Refer to the third vertical column in Figure 2A. At 80 percent "Distance behind" and 15.7 percent "Vertically above," the downwash angle, for a C_L of 1.00, is between 5.4 degrees and 4.8 degrees, or 5 degrees. For our lift coefficient of 0.3, this would be 0.3x5, or 1.5, degrees and is the downwash angle at the horizontal tail's location.

In Figure 1, there is a dotted outline of a tail *below* the wake center line—the tail location for many high-wing aircraft. The downwash-angle-estimating procedure applies, but the difference is that distance M would be a *minus* figure and H a *positive* figure, which would reduce the vertical displacement. Note how the downwash angles are reduced as the vertical displacement is increased.

TAIL INCIDENCE

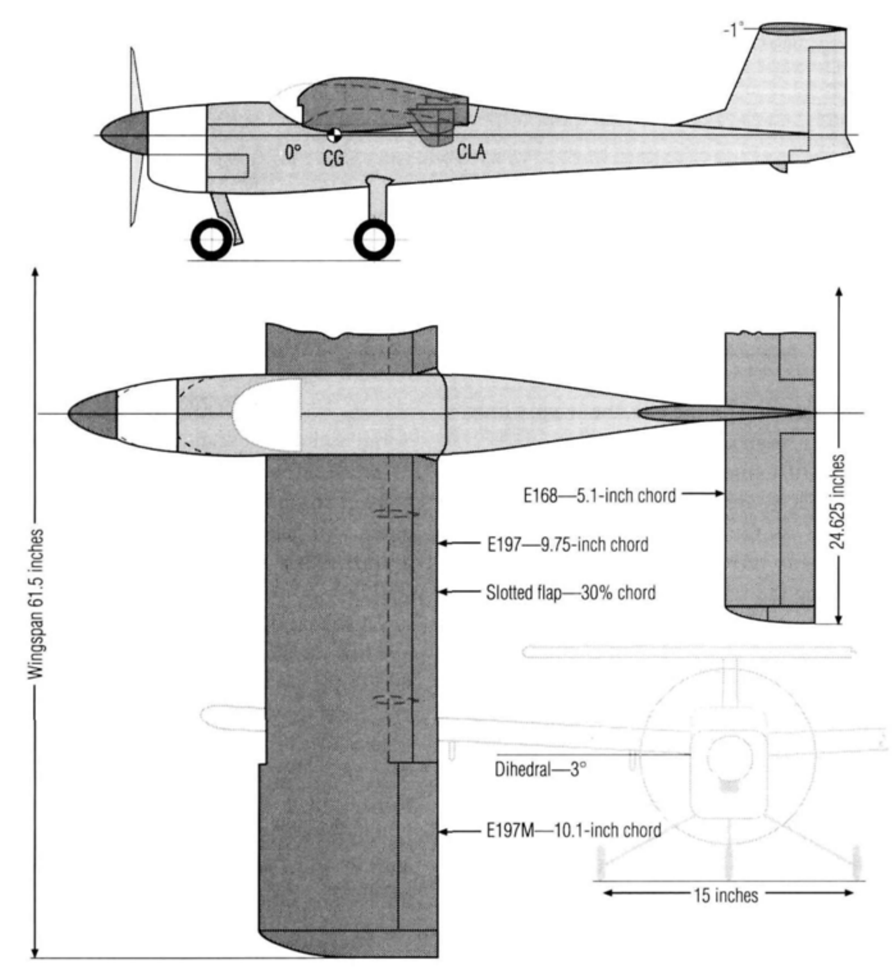
In the example above, the downwash angle is 1.5 degrees. If the tail angle of attack needed for balance were minus 2 degrees, that 2 degrees would be relative to the downwash angle. Figure 3 diagrams this relationship and shows that the tail's angle of incidence (relative to the model's center line, for this example) should be minus 0.5 degree. Caution: for cambered airfoils, the angle of zero lift is *not* the chord line as it is for symmetrical sections, but it can be several degrees *negative* as shown in the airfoil plots for the section concerned. This must be considered when establishing the angle of attack relative to the downwash. Note also that there's a major difference between angular settings for upright cambered sections and inverted cambered sections.

PATTERN-SHIP DESIGN

Pattern ships have evolved into configurations in which the four major moment sources have been reduced to a minimum:

• The CG is on or close to the wing's lift center (¼ MAC).

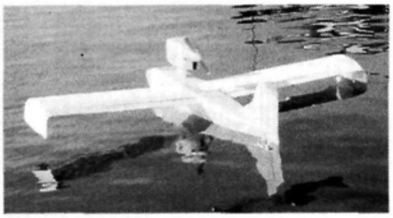
• The symmetrical airfoils have no pitching moment.



Weight—92 oz.
Wing area—600 sq. in.
Wing loading—22 oz./sq. ft.
Engine—0.46cid
Power loading—200 oz./cid
Prop—10x9

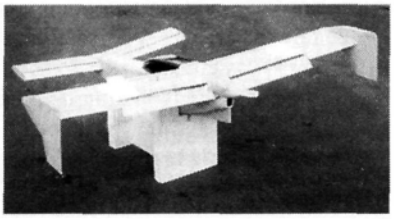
Figure 4. Swift.

Figure 5.
Seagull III flying boat



Gross weight—112 oz.
Wing area—649 sq. ins (4.8 sq. ft.)
Wing loading—23.3 oz./sq. ft.
Beam² loading —3.11 oz./sq. in.
Engine—0.46cid
Prop—11x8 pusher
Power loading—243 oz./cid

Figure 6.
Swan canard pusher



Gross weight—115 oz.
Wing area—669 sq. in.
Wing loading—24.75 oz./sq. ft.
Engine—0.45cid
Prop—10x6 pusher

Figure 7.
Seahawk

Weight—110 oz. (land), 121 oz. (water)
Wing area—655 sq. in. (4.54 sq. ft.)
Wing loading—24.3 oz./sq. ft. (land), 26.6 oz./sq. ft. (water)
Engine—0.46cid
Prop—11x8
Power loading—239.90 oz./cid, 263 oz./cid
Beam² loading—3.33 oz.

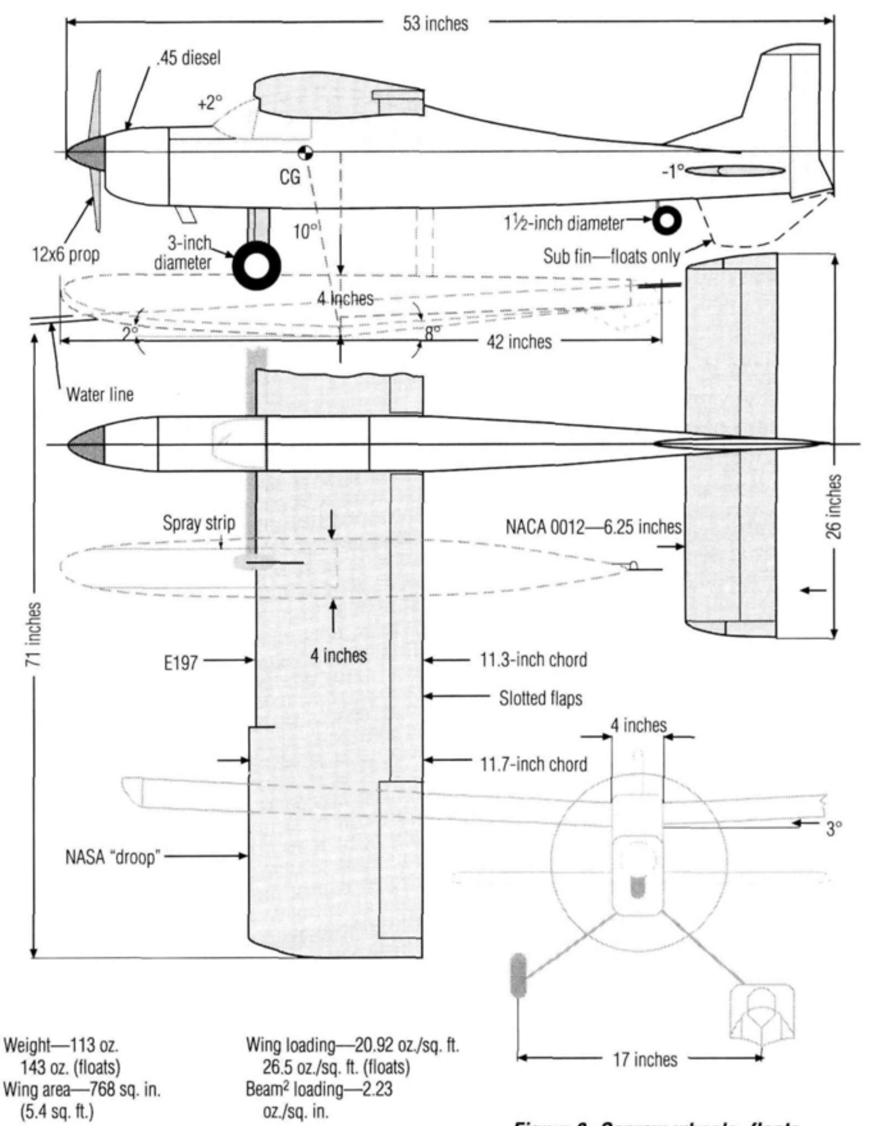


Figure 8. Osprey: wheels, floats.

• With the wing on the CG, the wing's drag moment is nonexistent.
• The thrust line passes through the CG. Tail surfaces are generous in area. "More is better" is the prevailing belief. These large areas move the neutral point aft, improving the static margin and permitting the CG to be behind the wing's ¼ MAC. In maneuvers, centrifugal force, acting at the aft CG assists; the model is more agile.

The wing and tail airfoils are both set at zero incidence—a "no-lift" condition. However, as soon as up-elevator is applied, the wing's angle of attack becomes positive; both lift and downwash are produced. That downwash strikes the horizontal tail at a negative angle, producing tail downlift that maintains the wing at a positive lifting angle. Inverted, the same conditions apply. In both positions, the fuselage is inclined at a slight nose-up angle to provide the wing's lift.

TAIL DEEP STALL

Some authorities state that, at high angles of attack, the wake from the wing may blanket the horizontal T-tail, and the airplane will have difficulty recovering from a stall. This condition is called "deep stall."

Cases of full-scale deep stall have resulted in fatal crashes. All have involved test-flights of twin or tri-jet aircraft with aft, fuselage-mounted engines and rearward CGs for the tests. In a stalled condition, the wing *and engine-pod wakes* may blanket the horizontal tail.

There are many prop- and jet-driven aircraft with T-tails that have no deep-stall problems.

RECENT DESIGN ANALYSIS

Figures 4 to 8 are illustrations of five recent designs.
• **Figure 4.** Swift (*Model Airplane News,* September 1993). The Swift's thrust line,

wing drag and CG are in line, and the CG is vertically in line with the ¼ MAC of the wing. The only significant moment is the result of the wing's airfoil pitching moment. At 60mph cruise speed, a tail setting of minus 1 degree proved to be correct.

- **Figure 5.** Seagull III flying boat (*R/C Modeler*, October 1992). This model had two major nose-down moments: the high thrust line and the wing's airfoil pitching moment. Centers of lift and drag coincided with the CG. The pusher engine arrangement was chosen so that the horizontal tail would be partly submerged in the powerful prop slipstream in the hope that pitch changes caused by power (rpm) variations would be minimized. Luckily, this was successful; the model exhibits no change in pitch as rpm are varied.
- **Figure 6.** Swan canard *(Model Builder*, October 1987). The nose-down pitch of the high thrust line is offset by the AFT wing's drag moment. Pitching moments of both fore and aft wings add to the foreplane's load. The foreplane downwash reduces the wing's angle of attack and lift in the area shadowed by the foreplane. The wing's angle of attack in this area was increased to compensate.
- **Figure 7.** Seahawk float and tricycle gear *(Model Airplane News*, October 1992). Here, the major nose-down moments are caused by the wing's drag, below the CG, and the wing's airfoil pitching moment. A thrust line above the CG adds to the nose-down moment. The ¼ MAC is vertically in line with the CG and produces no moments in level flight.
- **Figure 8.** Osprey tail-dragger and twin float plane *(Model Builder*, June 1991). The major moments caused by wing drag and the wing's airfoil pitching moment oppose each other. Thrust line and CG coincide, and the latter is vertically in line with the ¼ MAC in level flight.

References: *Model Airplane News* articles by Andy Lennon: "Airfoil Selection" Parts 1 and 2, May and June 1992; "Propeller Selection" Parts 1 and 2, November and December 1992; "Wing Design" Parts 1, 2 and 3, January, February and March 1993; "Horizontal Tail Design" Parts 1 and 2, November and December 1993; "Estimating Level Flight Speeds," February 1994. ■

Scale Contest for Beginners

A great idea for future growth

by PETE SEPULVEDA

BOY, IT'S amazing what a lot of hard work and weeks of preparation can produce. Several months ago, fellow F-Trooper and well-known model designer, photographer and R/C magazine contributor Dick Tichenor came up with a great idea: a scale contest for beginners. Our club—F-Troop of Southern California and Beyond—enlisted the enthusiastic support of the Scale Squadron of Southern California and the Orange Coast Radio Control Club, and they joined us at Mile Square Park in Fountain Valley, CA, as hosts of the event.

FANTASTIC FIRST

Because we had no way of knowing how big the turnout would be, we decided to combine our event with the long-established, highly popular Scale Un-Contest that's hosted by the Scale Squadron and also held at Mile Square Park. For the past few years, the number of participants in scale meets and fun flys has diminished in Southern California. We had hoped that a combined event would encourage newcomers to attend. It appears that we were on the right track because the meet was a definite success, so much so that we plan to turn it into a yearly event.

Mel Santmeyer's "Big Green Thing."


John Boudreau's Royal C-47.

Scale Squadron's Larry Wright was our contest director. He runs a tight ship, to say the least, and all rules were followed to the letter! The entry fee was $5 for any category, and 30 contestants participated in the combined event. This may sound like an anemic number compared with other scale events around the country, but it was a great turnout for a first-time event. More than half the participants signed up for the beginners' contest.

The youngest participant was 14-year-old Aaron Strietzel. With great aplomb, he flew a House of Balsa* 44-inch AT-6. Beginners had a lot of questions, and it was common to see experienced modelers hold up their aircraft and explain the scale details. I wish we could do this about four times a year!

We also held three seminars, which were all well-attended. In fact, we had a couple of stalled flight lines because of the number of fliers at the seminars! Bob Banka of Scale Model Research* gave a presentation on the documentation of a scale contest entry. Fred Browns, long-time scale and flight judge, discussed how contests are judged, and master flier John Elliot expounded on flight presentation.


PHOTOS BY PETE SEPULVEDA

Connie Vaughn holds Bob McClung's big Meister 190D. Note the backward swastika.

WINNING SKIES

Flying took place under clear skies with just a slight breeze. Our greatest fear was that the beginners would experience a strong crosswind in the pit area. Fortunately, the crosswinds were weak, and they blew away from the pits. The wind never affected the flights.

Four flight lines were used—two for the contest and two for the fun fly. Unbelievably, there were no conflicts or traffic problems, and no one landed on anyone else! We had a single impound area for both events, and the Scale Squadron members in the impound area (Roy Shelso and Ben Webster) did a great job.

Scoring was quickly and accurately calculated by Ron Wiser and his family! F-Troop supplied the four flight judges, and Scale Squadron and F-Troop provided the static judges. Feedback from the contestants indicated that the judges did their jobs well. One nice thing about beginners is that not a

A shot of half of the pits and the good-size crowd.

John Boudreau built this fine looking Buckeye from a kit and made many fine flights.

single contestant complained about anything!

Scale Squadron's Sam Wright (the golden voice of Top Gun '94 and the Scale Masters) handled the announcing; he was spelled occasionally by the equally talented John Elliot. The Orange Coast Club—a very large club that uses Mile Square Park as their home field—manned the raffle-ticket booth and the great (and always crowded) food and drink stand. We raffled off a P-40 ARF kit supplied by F-Troop, an Airtronics* radio and a K&B* .45 Sportster engine. The package was ready to fly; just add fuel and charge the battery. The winner almost fainted when his ticket number was called!

Harry Woods and his little "Disneyland" Lear jet. Donald Duck is the pilot.

While the fun-fly people flew nonstop all day, the contest participants flew two rounds that made up a shortened version of the normal scale contest maneuvers. There were mandatory and optional maneuvers, and the system worked well. We had the usual halftime lunch break when all the planes were lined up on the field so that the audience (which was quite large) could inspect the planes and talk with the modelers. During this show-and-tell, I counted more than 70 models on the runway with several still in the pits.

Left: some of the great planes on hand. Right: Dave Adams fuels up his Goldberg Sukhoi and Dynaflite Spitfire.

Lew Vaughn (flight judge) helps a beginner by taking "Jenny" to the runway before takeoff. Assistance and cooperation were the words of the day.

SPOILS OF WAR

Certificates were presented to all contestants, and framed certificates were presented to first- through third-place finishers in each category. All of these certificates were created by F-Trooper Steve Alvarado and his trusty computer and color-ink-jet printer. Each person received a care package at sign up; it consisted of two bottles of Zap*, a pen from Frank Tiano Enterprises* and a servo tray from Airtronics. A set of Don Smith* giant-scale Toucano and A-26 Invader plans were given away, courtesy of Don Smith. Frank Tiano Enterprises provided two, scale, radial engines and a set of scale, fiberglass, 500-pound bombs. Top Prize for First Place Sportsman was a free ride in the new Katana light plane, courtesy of Fred Browns and the Fleet Aviation Service and Training.

THE BEST BEGINNERS

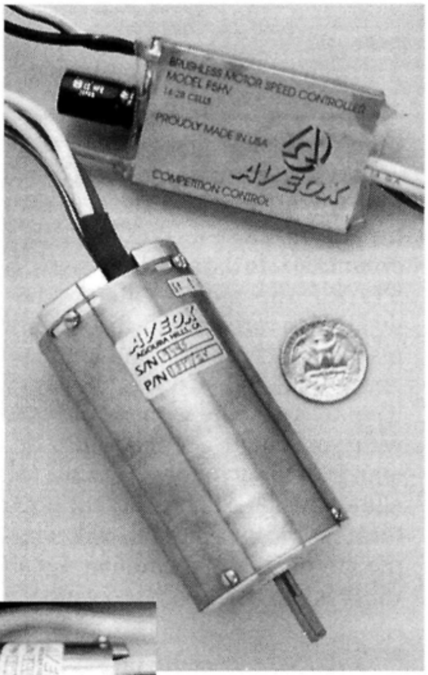
Categories for this event were Beginner Sportsman (those who never finished higher than sixth place in any other scale contest), Team Scale (beginner builders, any flier), and Beginner ARF. We only had one ARF entry.

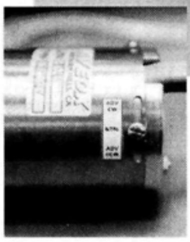
A Ryan STA, built by Bob Sheere and flown by Bill Hagthrop, won Team Scale. Bob's STA also took Pilots' Choice and High Static awards. In Beginner Sportsman, there was a tie for first place after two rounds. The tie was broken by using the high individual flight score as the tiebreaker. This had been determined prior to the rounds. Dennis Shimko and his Byron Corsair took top honors, winning the ride in the Katana. Second place went to Daren Savage with his beautiful Christen Eagle. Third place went to Alan Laidlaw and his truly striking Laser 200. The "Most Interesting Crash" award went to Bob McClung and his now-departed giant Meister FW-190D. Tail flutter was the apparent culprit, but the big "Dora" looked great prior to its "re-kitting"!

All in all, I have to admit that everything went even better than we had anticipated. We would have liked more participants, but that should come with time. I can say without hesitation that the beginners had a great time, and they went out of their way to let us know that! The three hosting clubs worked very well together, and each felt that it was a worthwhile experience.

I hope that other groups around the country will hold meets for beginners in scale. They're a lot of fun and a great way to attract new members.

*Addresses are listed alphabetically in the Index of Manufacturers on page 138.





Above: Jerry Bridgeman used the Aveox 1817/2Y brushless motor to take first place in the '94 F5B World Championships in Wangaratta, Australia. This amazing motor achieves peak efficiency of 93 percent at 800 watts out (at 15,780rpm, 24.2 volts, 35.6 amps in), and 89 percent efficiency at 1450 watts out (at 14,460rpm, 24.4 volts, 66.5 amps in). It weighs 560 grams, is 89mm long and has a diameter of 45mm. The Aveox speed control is also shown.

Inset: this detail of the Aveox 1817/2Y shows the variable-timing adjustment screw.

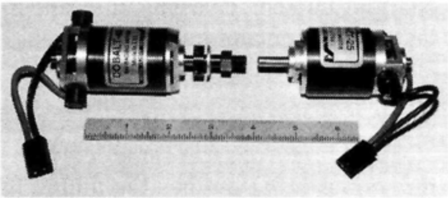
IMAGINE AN electric-powered R/C airplane that can streak upward at a 90-degree angle to nearly 1,000 feet in less than 10 seconds. Imagine also that this aircraft can dive at well over 100mph and easily withstand the stresses of an abrupt pull-out, yet it's also light enough to thermal efficiently. This is the kind of aircraft flown in the FAI competition category known as "F5B," which is a competition of technology as well as of skills.

BRUTE ELECTRIC POWER

F5B technology soars

by STAFF

These state-of-the-art planes have not figured prominently on the U.S. modeling circuit, but last year, U.S. F5B flier Jerry Bridgeman took the Gold in this challenging event. The technology now used in F5B and the way in which the U.S. team used the Aveox brushless motor to its best advantage are remarkable.



Astro Flight's new 5-turn FAI 25 and FAI 40 motors are available in direct-drive and geared versions and are well suited to 10-cell F5B use. (See Tom Hunt's motor review in our October '94 issue.)

THE MOTORS

The motors used in F5B have historically been produced by the USA's Astro Flight* and by German companies Keller (distributed in the U.S. by Pica/Robbe*), Plattenberg and Hectoplatt (both distributed by Hobby Lobby*).

At the most recent F5B competition, Robbe showed their geared motor with variable-pitch propeller, and the Swiss and Germans used this setup with some modifications. The U.S. fliers

WHAT IS F5B?

by KEITH FINKENBINER

Formerly called "F3E," F5B is an electric sailplane aircraft classification of the Federation Aeronautique Internationale (FAI). It's a specialized event in which pilots seek optimal performance from the airplanes, power sources and motor/prop combinations. The event consists of two tasks—distance flying and thermal duration—followed by a spot landing.

• **Distance flying.** The event starts with this task, which is flown between two parallel planes, or stations, that are 150 meters apart (see diagram). The stations' respective bases are referred to as "base A" and "base B."

While the pilot stands at base A, the plane climbs under power behind base A and then enters the course, motor off. Within a 3-minute window, the pilot must try to fly as many laps between the two bases as possible. A pilot earns 10 points for every lap completed—typically, 26 to 28 laps. The motor can't be run while the plane is flying on the course.

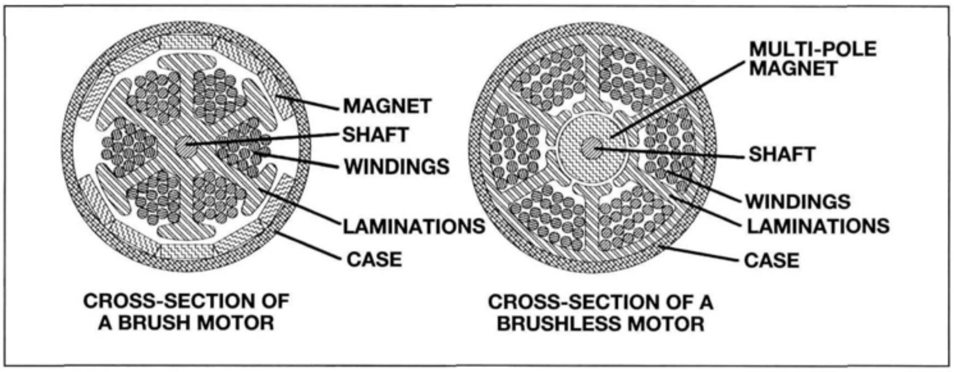
As the pilot flies, sighting and signal devices are used to determine the completion of every lap. In most cases, the pilot would run the motor and climb out three or four times during the 3 minutes to maximize the number of laps.

• **Thermal duration.** This must be completed immediately after the distance event. The pilot climbs out, turns off the motor and then dives down and zooms under a 20-meter-wide, 3-meter-high "limbo" gate. The pilot has 1 minute to do this; then he climbs out—with or without power—to start the 5-minute thermalling portion. Each second of flight time counts for 1 point, but for each second of motor time 1 point is deducted. A typical thermal flight will use 10 seconds of motor run during this segment.

• **Spot landing.** This is completed directly after the duration task. Extra points are awarded if the model comes to rest in a 15-meter circle (for an additional 30 points) or a 30-meter circle (15 additional points). Many world-class pilots will dive through the limbo gate and not use any motor time to accomplish the 5-minute thermal task, then they'll land in one of the circles for additional points. Note that completing more laps in the distance portion will outweigh the few seconds of motor run required to complete the duration task.

In world-championship competitions, top pilots sometimes fly 29 laps (for 290 points) and will use only 5 seconds of motor run to

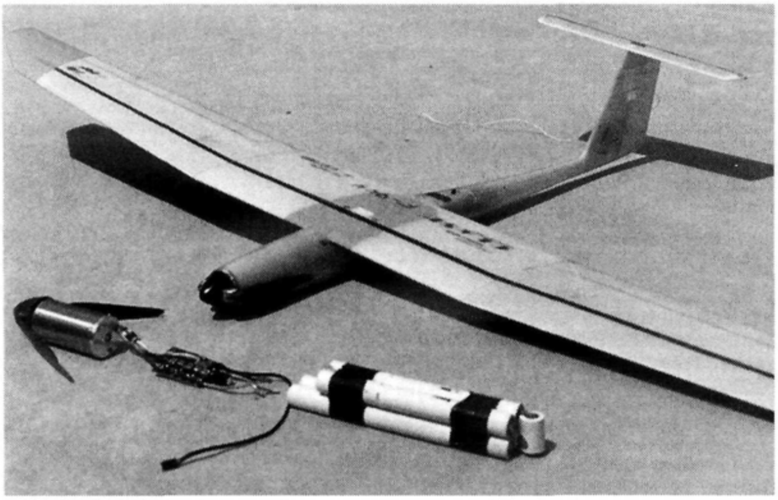
used the new Aveox* 1817/2Y brushless motor with direct-drive propellers. The differences between the groups were very apparent, and the stage was set for a technological showdown. Reigning champ Rudi Freudenthaler used the Plattenberg HP355 motor and a prop of his own design (see "How the U.S. Won in '94" sidebar).



GETTING STARTED

What are the requirements for getting started? F5B flying requires good building and flying skills and some knowledge of electronics. Most of the aircraft components can be bought directly from large hobby distributors in the United States. If you're new to this branch of the sport, you'll probably want to start in the 10-cell class, which is recognized by both the FAI and the AMA. (See the "What is F5B?" sidebar.)

Several companies offer sleek electric designs that, if fitted with a sufficiently powerful electric system, could perform well in the 10-cell category. Among these manufacturers are Airtronics*, Hobby Lobby, Pica/Robbe, Northeast Sailplane Products*, and Slegers Intl.* A variety of suitable, potent, 10-cell motors is available for these electric "rocket ships."



The Aveox 1817/2Y power system shown uses 27 Ni-Cd cells, an Aveox motor, speed control, propeller and spinner developed by U.S. F5B team member Steve Neu.

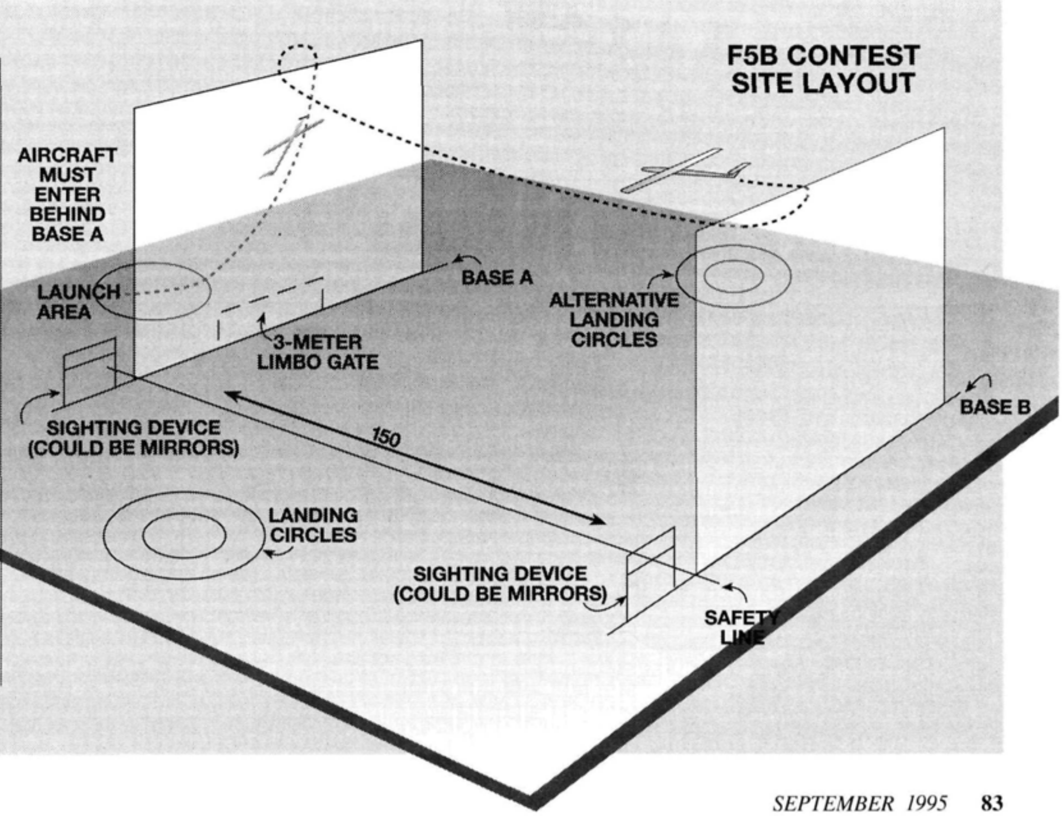
Many electric model clubs out there can help you to get started. Note also that the AMA has designated F5B contest directors for nationwide regional competition, and it sponsors the team-selection finals, which will be held this year in August or September. If you're interested, contact the competition department for details and entry forms: AMA, 5151 E. Memorial Dr., Muncie, IN 47302; (317) 287-1256.

[Editor's note: we thank U.S. team manager Keith Finkenbiner, Dave Palombo of Aveox and Edmund Bassick for their contributions to this article.]

inish the 5-minute thermal duration task (for an additional 295 points). They then may land in the 15-meter bonus zone for a total of 290 + 295 + 30 = 615 points. World championships are usually decided by fewer than 15 points after the pilots have flown eight rounds and "thrown out" their lowest score (best of seven).

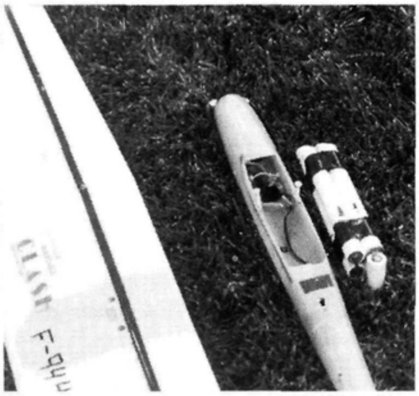
Which skills make a good F5B pilot? Most—but not all—of the best pilots earned racing skills by flying slope racing. The hand/eye coordination needed to slope race is similar to that needed to fly distance laps on an F5B course. But thermalling skills are also needed for the duration portion.

10-cell competition. Bonus points are given when smaller power systems are used: e.g., for 8 to 10 cells, 15 additional points per lap in the distance leg.



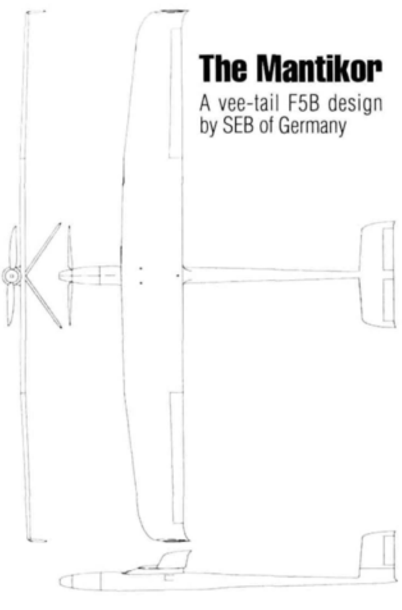
F5B Aircraft Construction

Steve Neu holds the "Clash" model designed by Tal Nizri of France.



Note that the battery just fits into the fuselage—a tight fit.

F5B models have evolved around Sanyo* 1000mAh SCR nickel-cadmium (Ni-Cd) cells. These cells somewhat dictate fuselage size and model weight. Typically, the models are of epoxy and fiberglass construction, and most are molded in female molds and have a span of 1.8 meters and weight of 2,600 grams. The wings are made in one piece for strength and lightness. The following specs describe the planes flown by the U.S. team at the '94 F5B competition.



The Mantikor
A vee-tail F5B design by SEB of Germany

USA F5B TEAM'S SPECS

- **Fuselage**—Kevlar/fiberglass cloth and epoxy resin; typical weight—4 ounces.
- **Wing**—molded of fiberglass and epoxy resin in female molds; typical weight—12 ounces.
- **Stab**—molded of fiberglass and epoxy resin in female molds; typical weight—1 ounce.
- **Motor/electronic speed control**—typical weight: 18 to 20 ounces. U.S. team's Aveox 1817/2Y motor: dimensions—1.8x3.4 inches (diameter x length); weight—17 ounces. Speed control: dimensions—2.5x1.5x0.4 inches; weight—2.5 ounces.
- **Power**—14,000rpm with 12x6 prop; 60 to 65 amps at 24 volts; 1,560 watts in, 1,404 out. At 60 amps, motor is 90-percent efficient.
- **Prop**—carbon fiber 12x6; weight with all mounting hardware—1 ounce.
- **Radio control**—Airtronics Vision radios with separate aileron servos and single elevator servo. Mixing allows "crow" position of ailerons for more accurate landings.
- **Battery**—27 selected Sanyo 1000mAh SCR cells; maximum weight—39 ounces (with all connectors).

Robbe's VARIABLE-PITCH SYSTEM

PHOTO BY DAVE PALOMBO

The technical sophistication of Robbe's variable-pitch system raised many eyebrows at the '94 F5B competition. On the back of the motor, there's a small servo that drives a pin that runs through a hollow shaft that goes through the motor to the prop hub. When the servo moves, the prop's angle changes. On the front of the motor, there's an oil-filled planetary-gear set that's remarkable for handling such high power in such a small size.

Next to the motor, the box with two tubes sticking out is an air-pressure sensor. Mounted on the wing's leading edge, it reads the air speed and sends its signal to a microprocessor unit (shown at front center, next to the motor). This control box controls the prop's pitch in relation to air speed and features a user-selectable pitch/speed curve. This innovative system uses a conventional motor design with brushes.

[Editor's note: to the best of our knowledge, this system is not offered commercially but was custom-engineered for selected European F5B pilots.]

HOW THE U.S. WON IN '94

Since 1986, when they were started at Lommel, the Netherlands, the F5B World Championships have been held every two years at a variety of international sites (F5B is one of several categories of FAI competition). With their innovative technology and expert flying, Austria and Germany have so far dominated the event.

Until '94, Austrian Rudi Freudenthaler had taken the top honors every year. In recent years, the U.S. had been close: Jason Perrin placed second in Austria; Jerry Bridgeman took second in Belgium; and the U.S. team placed second in '90 and first in '92. In '94, 15 teams competed from as far away as Japan and China. Bridgeman won the Gold and became world champion, and the American team took second overall (first and third team positions went to the Austrians and the Germans, respectively).

FLIGHT-LINE FOREBODING!

In late '94, the U.S. team heard rumors about the Germans having made a deal with Robbe to produce a "world killer" motor/propeller configuration that would give them a technological edge. They also heard that Freudenthaler had turned 30 laps in competition and would again be difficult to beat.

Above: 1994 F5B Team USA. Left to right: Bob Sliff, Jerry Bridgeman, Keith Finkenbiner and Steve Neu.

Above: the man to beat in recent F5B competitions: Rudi Freudenthaler of Austria holds his Surprise IV F5B ship.

Team manager Keith Finkenbiner reports: *"When we arrived in Australia, the weather wasn't cooperating. At the airport, we found hail and mid-30-degree temperatures. Chris Greenwood, World Championships secretary, assured us that Melbourne's weather is changeable and that once we cleared the mountains, the weather in Wangaratta, 220 kilometers to the northeast, would be better. Although the forecast was for 60 to 80 degrees Fahrenheit with light and variable wind, this wasn't what we found. The unusual weather played an important role in our winning strategy.*

"During practice sessions, we assessed the new Robbe motor and propeller technology. The planes climbed very quietly with the large, slower turning propellers; but the planes weren't climbing any higher than ours, and we started to see a flaw that could give us an advantage. Their planes couldn't accelerate quickly when entering the course because their large propellers had to be stopped early or the drag would actually slow them down. The Germans and Austrians also practiced only high climbs—as all the Europeans were doing—and flew six-lap cycles. This strategy works well when there's low wind and thermal activity, but we weren't seeing these conditions, and we started to practice four-lap cycles in which we could see the plane clearly and call the turns very precisely. We were only using 6- to 7-second motor runs, and the efficient Aveox brushless motor allowed us extra time for more laps on the course.

"The championships came down to the seventh and final round in which Freudenthaler was leading Bridgeman by 6 points out of 3,600 points, and the weather was deteriorating rapidly into very strong winds (over 30mph) and rain squalls. Called to fly first, we knew that our four-lap strategy would be put to the test with all the teams watching. Bridgeman flew a flawless round and posted a 602-point flight. Freudenthaler tried the high-climb, six-lap cycle and had trouble staying on course. He cut a pylon and lost valuable time. His final score was 561 points and Bridgeman was the new world champion."

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

F5B competitors at Wangaratta, Australia.

FIELD & BENCH REVIEW

A no-hassle heli

KYOSHO Hyperfly

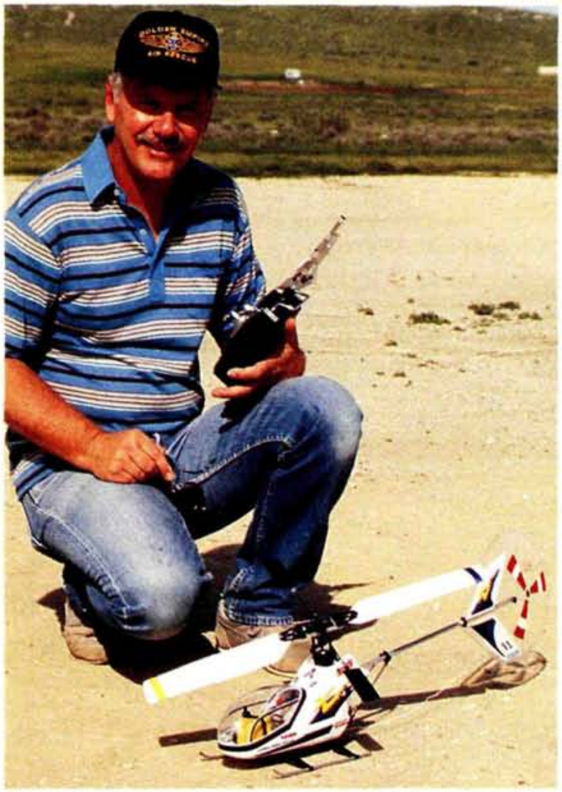
by SKIP RUFF


PHOTOS BY SKIP RUFF & WALTER SIDAS

EVEN THOUGH I enjoy almost all aspects of both full-size and model aviation, I must admit to having always had a special fondness for helicopters. All those gadgets and gizmos working in unison (most of the time!) to produce a machine with the flight capabilities of a hummingbird just fascinate me!

HYPER ABOUT THE HYPERFLY

When I saw the first ads for this machine, I knew I had to have one! The advertised features—simplicity, lightness, electric power, low cost and especially the as "easy to fly as a sailplane" claim by its manufacturer—meant that here, at last, was a helicopter that even a "fumble fingers" like me might be able to handle without a case of "white knuckles" (or thumbs) on every flight.



How can a helicopter fly on only two channels and with no tail rotor? Well, the Hyperfly does have a conventional fixed-pitch rotor head with a swashplate, and flybar paddles give the rotor fore/aft and left/right cyclic control; this action uses both channels. There is no throttle; the machine flies wide open until the battery begins to run down, allowing the helicopter to slow and descend for a landing. When close to the ground, a tripwire connected to the motor switch is kicked up to shut off power to the rotor and allow the model to land.

OK, now what about the conspicuously absent tail rotor? Well, as many of you are undoubtedly aware, most full-scale choppers (except the Notar, which has no tail rotor but does have an anti-torque mechanism) are designed to be able to maintain powered forward flight in the event of a failure somewhere in the tail-rotor drive train. That's one of the reasons why they have vertical stabs. The key words here are "forward flight" and "vertical stab." The Hyperfly takes this capability to the extreme by doing away with the tail rotor entirely and having a very large, offset vertical stab (or fin) that counteracts torque from the main rotor. Of course, this means that the model must be in forward flight at all times. In actuality, the ship flies more like a fixed-wing aircraft than a helicopter.

The elimination of the tail rotor has a few more advantages, such as a nearly 50-percent reduction in mechanical complexity and more available power for the main rotor (a tail rotor and its drive train typically consume approximately 30 percent of available motor power). Also, without a tail rotor, you don't need an expensive helicopter radio with mixing functions and gyro.

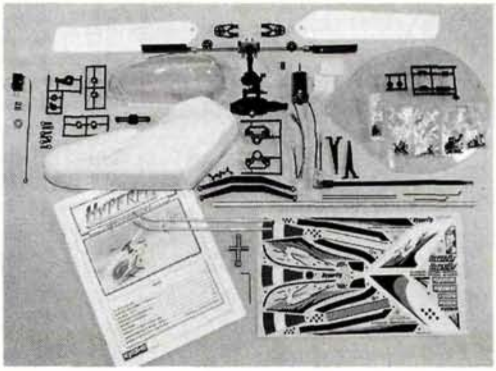
The absence of a tail rotor means the Hyperfly is incapable of a true hover (though it's advertised as being able to "hover" in a headwind), but it also means that the pilot doesn't have to worry about coordinating four controls at once, which is required for all other helicopters.

ASSEMBLY

I don't want to echo the construction manual, so the following are my own observations and suggestions, which you may find beneficial.

For $439.99, you can buy the Hyperfly as a full combo package that includes the helicopter, special Futaba 2-channel, 2-stick (Mode I) 2V radio with a BEC receiver, two standard S-148 servos, a special Hyperfly 7.2V 1100mAh flight battery and a Hobbico 801 AC/DC charger. An instructional video is also available for $11.99. You can also buy just the helicopter ($219.99) and two battery packs (6-cell—$39.99 each; 7-cell—$49.99 each). I was supplied with the heli and two packs for this review (all prices are suggested retail).

The kit comes with all the pieces that you need to make a ready-to-fly machine, minus radio and battery. One outstanding feature is the factory-assembled rotor head/frame/mast assembly, which would


Hyperfly kit contents.

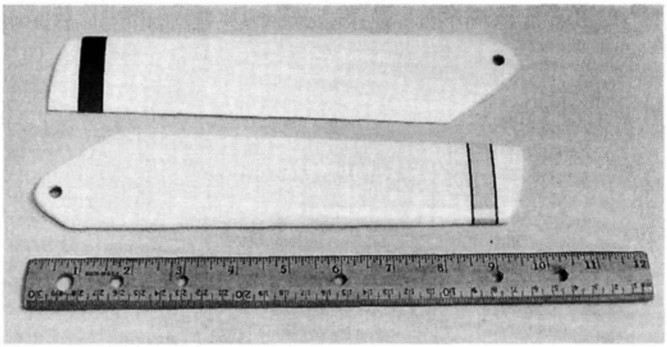
Close-up of the factory-assembled rotor head/frame/mast assembly.

otherwise be the most difficult construction step; what a time-saver!

An Allen wrench and a special cross wrench are included in the kit, but to complete the model, you'll need a small Phillips screwdriver, a tiny bit of CA, needle-nose pliers, a hobby knife, some good scissors and a 3mm (7/64-inch) drill bit.

The Kyosho AP-29 motor comes completely wired for installation; no soldering is required unless you need to change the connectors for your charger or radio needs. I should add that this AP-29 is not identical to those in some of Kyosho's other electrics; its timing has been altered for more power output, and a quick count of gear teeth showed a motor-to-rotor-shaft reduction of about 7.3 to 1.

The included 20-page manual pretty much covers everything you'll need to know to construct and fly the model, and it includes an exploded view of the model and a parts list. The construction diagrams consist mainly of line drawings, a few written notes and a variety of symbols denoting such things as "Assemble in specified order," and "Pay close attention here," etc. If you do pay *close* attention, you'll find that the manual does indeed explain everything that needs to be explained.



No, these are not tail-rotor blades; these go on the main rotor!

The helicopter is mostly plastic: the main frame and flybar paddles are hard black plastic, the fuselage shell is blow-molded polypropylene, the canopy and tail fin are Lexan, and the rotor blades are a molded, hard-skinned foam with wooden inserts at the attachment points.

Other than screws, bolts, rods and a few other fittings, the only metal on the airframe is the aluminum tail boom and skids and the steel rotor shaft and flybar. By the way, the rotor shaft is a hefty 1/8 inch in diameter, and I'm sure that the 1/16-inch flybar is tempered (you'll see why I'm sure in my flight report!). The rotor shaft runs in two ball bearings, and another ball bearing is used in the swashplate.

The rotor head is best described as semi-rigid because the flybar is free to teeter and the rotor blades are not. Because of the fiberglass hub plate and flexible blade grips and blades, the rotor disk does tilt noticeably when you apply cyclic control to the turning rotor, giving a strong pitch or roll input to the fuselage. Although the blades have no built-in cone angle, they do "cone up" considerably when the rotor is turning at full rpm.

When applied properly, the very nice sticky Mylar decals will make your model very attractive. Use a mixture of dish soap and water to help apply the decals.

The manual tells you to balance the rotor head by running the assembly (minus the rotor blades); if you feel vibration, add a 1-centimeter-square piece of clear Mylar from the decal sheet to the leading edge of one of the paddles. Notice whether the vibration increases or decreases; if it increases, move the Mylar piece to the other paddle. I found that the rotor shaft turns freely enough (with the motor removed) to allow the flybar to be statically balanced. Holding the main frame on its side, I stuck a much larger piece of Mylar on the light paddle and trimmed it a bit at a time until the rotor shaft remained stationary in any position. I then neatly applied the Mylar piece to the leading edge of that paddle.

SPECIFICATIONS

Model name: Hyperfly
Type: electric-powered R/C heli
Manufacturer: Kyosho
List price: $219.99
Rotor: 23¼ in.
Disk area: 422 sq. in.
Disk loading: 8½ oz.
Weight: 24½ oz.
Length: 36 in.
Motor used: Kyosho AP-29 (included)
No. of channels required: 2
Airfoil type: flat-bottom
Features: except for a few construction tools, the kit is complete and includes a motor. Components are primarily all plastic with screw- and bolt-together construction. The rotor blade is made of molded foam with a hard plastic skin.

Hits
- Main frame and rotor head are factory-assembled.
- AP-29 motor pre-wired for radio and battery.
- First-rate parts quality and fit.
- Easy, rapid construction.
- Extremely rugged.
- Inexpensive.

Misses
- The tail boom, when installed according to the instructions, is angled up too high, making a boom strike from the rotor blades easy (see text).

Although the manual suggests the same balancing procedure for the main rotor blades, the blades included with my kit weighed exactly the same—10½ grams each—and required no balancing! Once the blades had been tracked properly as outlined in the instructions, the rotor ran smoothly. In my case, it helped to have the swashplate horizontal in both axes during run-ups to accurately determine any out-of-balance condition.

To allow the battery to seat properly, I trimmed away some of the battery shrink-wrap and removed a bit of plastic from the battery saddle, but otherwise, I had virtually no problems during assembly. The advertised 4- or 5-hour construction time isn't too far off if you don't account for decal application. Overall, the quality and the parts fit is absolutely first-rate; I've never seen better!

RADIO AND BATTERY

If you don't use the supplied combo radio, Kyosho recommends the Futaba* 4NBL (Attack-4) with servo reversing (required), R112JE 2-channel BEC receiver and S-148 servos. The receiver must be BEC-

FLIGHT PERFORMANCE

• Takeoff and landing
The model must be hand-launched, and launches and landings must be into the wind. To land at the desired spot, you just need a bit of skill and luck.

• High-speed handling
The model has good response at high speed and is very stable. To maintain high speed without climbing, hold forward cyclic control.

• Low-speed handling
The model can be flown almost at a walking pace, and it won't try to torque-yaw. With practice, you can stop it completely, allow it to pirouette and then resume forward flight in any heading you like. As the battery nears exhaustion and rotor rpm slow, the controls become less responsive and aft cyclic is needed to keep the nose up. Handling is still fine, though.

• Aerobatics
The model will perform a decent stall turn (to the left only!) and with practice, you'll be able to make it pirouette on command. It won't quite loop though, and I didn't attempt rolls. Inverted flight? I don't think so! *[Editor's note: Kyosho's test pilots say that the Hyperfly is capable of performing barrel rolls.]*

equipped so that the flight-pack battery can be dispensed with to save weight. I went with the manufacturer's suggestions all the way, using the standard S-148 servos, which look absolutely enormous bolted to the little machine. The servo mounts were designed to also accommodate mini- or microservos if you want to save more weight.

The special 6-cell 1100mAh battery pack designed for the Hyperfly uses Sanyo cells, which are quite light for their capacity; the pack only weighs 6½ ounces (177 grams). The Hyperfly pack should not be charged at a rate of more than 2½ amps. The manual states that, during extensive testing, these cells proved to be the best in terms of power/weight and power/curve characteristics; the power drop toward the end of the run is very gradual, and that's essential for a helicopter, which obviously has no "glide!" I'm no battery expert, but I believe Kyosho's claim.

The only other cells I've used that are anywhere near these Sanyos in terms of quality are SR Batteries* Magnum 1250 cells, which have the same diameter but are ¼ inch longer. A six-pack of these would weigh about 1 ounce more than the Sanyo pack. My Tekin BC 100L peak-detector charger with its adjustable amp output worked well for this review.

THE SETUP

Completed and ready to fly, my model came out at 24½ ounces—a hair under the advertised flying weight. A few checks showed a peak rotor rpm of 1,950 while drawing 16 amps. Incidentally, there was no mention of breaking in the motor in the instructions, so I did not break mine in. Nothing was said about the CG either, so I assume it isn't critical as long as the suggested radio components and battery are in their proper locations. For the record, when my machine is suspended by the flybar, it hangs with the landing-gear skids nose-down a couple of degrees.

The Hyperfly is everything Kyosho claims it is: light, extremely rugged, inexpensive, easy to assemble and easy to fly! If you've ever considered giving helicopters a "whirl" or would just like a change of pace, this is what you're looking for. You won't find anything better!

** Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

MICHAEL LACHOWSKI

GETTING THE MOST OUT OF HLG

This month, I want to talk about hand-launch flying. For many, this is a real challenge. How do the experts do so well when all *you* get is a bunch of short flights and a sore arm? I'll point out a few common mistakes made by inexperienced hand-launch glider (HLG) pilots.

LAUNCHING MADNESS

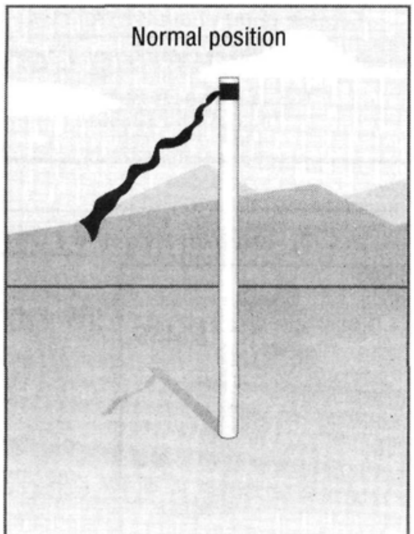
Many people think that because the experts launch high, that's the secret. The real secret, however, is picking the best air in which to launch. You're making a big mistake if your approach is to throw and throw. Eventually you'll find a thermal because you finally launched at the right time. Your launches in poor air will produce short flights, and you will become worn out. If you fly in a contest with a limited number of launches, you'll waste valuable flight attempts. Your flight total for the round may be very poor because you wasted all your launches in bad air.

Not everyone is an expert at picking the best air. If you fly with some good pilots, then you should key off their flights. So you can see what's going on around the field, avoid being upwind of everyone. Stay with the pack instead of moving off to one side!

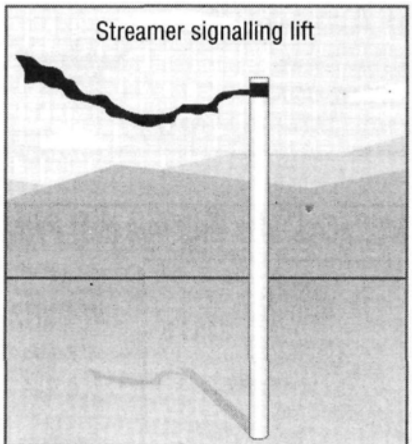
Work on detecting temperature differences, and watch for wind shifts. Many pilots like flying in shorts so they can feel small temperature changes. When there are no lift indicators and you want to launch, fly fast and cover plenty of ground to the left or the right. The more air you cover, the better the odds are of finding lift. Don't hesitate to land and re-launch when you do find lift at an extremely low altitude. Thermalling out from 3 to 4 feet is

A GOOD LAUNCH

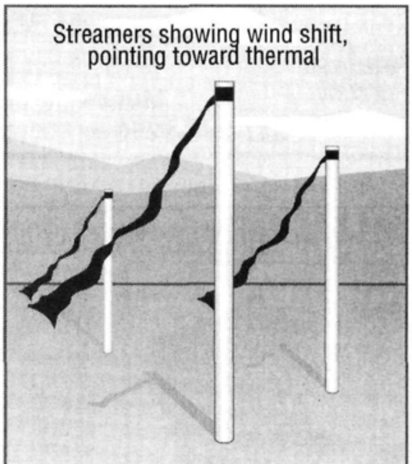
In this launching sequence, you can see Brian Agnew move up the field to look for some signs of lift. He's sure of where he wants to launch and search for lift when he starts the throwing motion. You don't have to be big to throw well in HLG. To get good launches, you need to extend your throwing motion and to practice. Throwing a model the same way you throw on a winch launch just isn't good enough.



A streamer blows with the breeze and makes a fairly straight line in the air.



With lift close to the streamer, the end or even the whole streamer will rise toward the lift. A streamer may have been hanging down more than usual because the wind speed slowed just ahead of the thermal.



Streamers won't tell you exactly where a thermal is, but they'll point you in the right direction. Several streamers around a field will point toward the thermal, and that makes it easier to find.

difficult, and any mistake can put you on the ground. You might lose the chance to re-launch into the thermal, too.

WISHING FOR A THERMAL

Now you launch; your glider arcs upward and you start to turn it. Why did you do that? When you launch directly into a thermal, you should circle. (You'll recognize a thermal by the presence of another model or debris or bugs in the air.) Usually, you should level out first and start searching for lift. You will get a longer flight by turning less when you aren't flying in lift. By flying forward, left, or right, you will cover more air instead of just circling in the same air. When the model reacts to lift, turn it immediately. Everyone wants to launch directly into a thermal, but usually you have to seek them out. If the air is poor that round, the extra seconds will significantly improve your score.

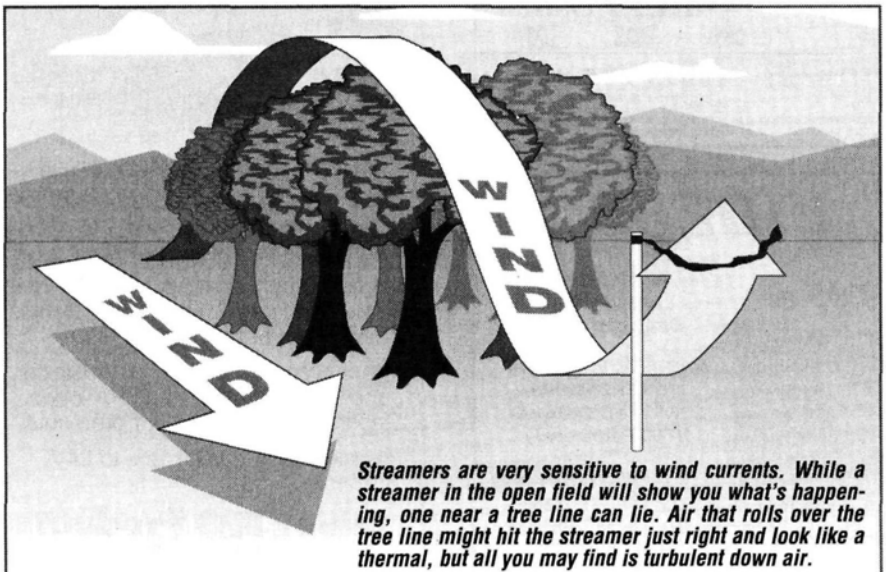
TUNNEL VISION

A particular thermal marker, e.g., a Mylar flag, may work well for one flight, but that doesn't mean that thermals will continue to converge at that spot. Good pilots make use of every bit of information available to them. They can quickly scan a field for signs of lift such as wind shifts and models already in thermals. When you watch just one or two markers, you'll miss many valuable lift indicators. If everyone else is intently watching an indicator, you should look elsewhere. When they see lift, they'll launch, and you can follow suit. Meanwhile, concentrate on finding what they're missing.

TIMING

Flight timing and round-window timing can be demanding in man-on-man HLG contests. To do them right, your timer needs two watches. I prefer to have at least one countdown watch for the round working time. Pilots need regular updates on their flight times and working times. Some pilots prefer to have a flight-time countdown; others like to hear the actual flight time.

Toward the end of a round, a less-than-maximum flight time can be important. Let's say you score the three best flights with one good flight and two short flights already recorded. If you fly to max time near the end of a round, you won't be able to launch for another flight in that round. Sometimes, it's advantageous to take a less-than-maximum flight time so you can launch into another flight that might improve the total score. A timer must be especially aware of this



Streamers are very sensitive to wind currents. While a streamer in the open field will show you what's happening, one near a tree line can lie. Air that rolls over the tree line might hit the streamer just right and look like a thermal, but all you may find is turbulent down air.

LET THE FUN BEGIN

Welcome to the Internet Mailing List Radio Control Soaring Exchange. It's being provided to facilitate the exchange of ideas among R/C soarers and as a source of information on related products. You'll find many R/C soaring enthusiasts listed, along with contact folks from various soaring clubs in the U.S. and abroad; you'll also find industry-related people (manufacturers of kits, software, equipment, supplies, etc.) Information on all aspects of R/C soaring is welcome, e.g., fun flying, slope soaring, hand launching, thermal duration, slope racing, F3B, F3J, F3F, electrics, wings—anything about gliders!

This list is managed by an automated mailing-list-management program called Majordomo. To be added to the list, simply e-mail to soaring-request@airage.com the following message: *subscribe*. You'll get an automatic response when you've been added to the mailing list. You can request additional information and learn about the commands the mailing list understands by sending the word "help."

To remove yourself from the list, send the message: unsubscribe. To post a message to the list, just mail the message to soaring@airage.com.

There's a digest version available for those who don't like to clutter up their mailboxes with lots of messages. The digest compiles messages and sends them out in groups. Subscribe and unsubscribe requests should be sent to soaring-digest-request@airage.com; posts should be sent to the regular address: soaring@airage.com.

SUPPORT

I thank the folks at *Model Airplane News* and Air Age Publishing for providing the computer resources necessary to manage and operate the mailing list. It wouldn't be possible without technical support from Gordon Oppenheimer and management support from Tom Atwood.

Michael Lachowski—mikel@airage.com

situation when flights can continue after a launching window has expired. Practice adding those minutes and seconds.

MYLAR THERMAL STREAMERS

One great thermal indicator is a light Mylar streamer at the top of a long pole; FAI Model Supply* offers excellent streamers. They're very sensitive to wind shifts; thermals will lift the streamers and bad air will cause them to hang.

Wind shifts caused by thermals will change the direction of the streamer, and it will point toward the thermal. With more than one streamer on a field, you can use the directions in which they're pointing to find thermals. A limp streamer doesn't necessarily mean there's down air. It may be the result of reduced wind speed just downwind of a thermal; a few moments after having hung low, the streamer will dance and be lifted skyward by the thermal.

The streamers can be extremely sensitive to wind speeds, and a streamer that's a little downwind of a tree line can produce false results. Air that rolls over the tree line may fall and then rise back up slightly downwind of the tree line where the streamer is. This situation would probably result in a very short flight.

Use all the resources that are available to determine where the lift is. Watching experienced pilots will help, and if you don't understand something, ask questions; most pilots are willing to help out. Knowing how to search for lift and being able to recognize it will prevent you from wearing out your arm and shoulder. When you throw, remember to use your body, not just your arm. That's all until next month.

**Addresses are listed alphabetically in the Index of Manufacturers on page 138.* ■

HAL DeBOLT

ONE CLUB'S STORY

THE EARLY GROWTH of R/C depended on many things, paramount among which were model clubs in which enthusiasts worked together to master the mysteries of remote control. How the clubs started and evolved and in what manner they contributed to R/C is part of our heritage. While this month's subject is close to *my* heart, the story of *your* club could be just as interesting; why not stir up some memories and tell us its history?

This typical Buffalo R.C. Conference program lists activities.

In 1941, when free flight was king, Fred Judge, George Hausner and others organized the first Buffalo, NY, AMA club—the Buffalo Aeronuts. The flying site at Wherle and Young Roads went on to become a mecca for western New York modeling. Aeronuts—like most other clubs back then—was predominantly a "sport" club, although several members—including me—became competitive.

The Flying Bisons held briefing sessions to help members learn R/C. Large, dry cells were used to maintain critical demonstration voltages. Left to right: Don Hobel, Wally Krull, Mat Maloney, Allen Labate, James Moynihan, Joe Messing and Sperry Shea.

As with many clubs, Aeronuts was dissipated by WW II. The club had to reorganize in the postwar era. The War also moved free flight to the background and control line (CL) to the foreground. Western New York modelers, like many others, were soon deep into this new phase.

Early in 1946, several of the remaining Aeronuts, including Vern Krehbiel, Jim Moynihan and me, spread the word that a reorganization was being considered. The first meeting in the Dmeco office led to the formation of the Buffalo Miniature Aircraft Engineers—the Flying Bisons.

FLYING BISONS

With CL in its heyday, the Flying Bisons established three CL circles at the Wherle and Young location, across from the free-flight site. The club became competition-oriented and conducted major meets—including Plymouth regionals—with generous awards. The site also saw numerous national AMA CL speed records being set.

Winter is *real* in Buffalo, and outdoor winter flying is impossible. The Flying Bisons' solution was to fly weekly in the local National Guard armory. After a session that had three CL circles operating, you needed a knife to cut the smoke! But the Guard never complained about the smoke or the noise. These sessions earned national acclaim when Len Wagner set the first CL speed record of more than 165mph using the new McCoy .49 in his Speedwagon.

Obviously, the Flying Bisons were on the leading edge of modeling; so in 1951, when Tom Parry showed the practicality of R/C, George Swank and I gave it a try. Following our success, this CL club switched practically overnight to R/C!

GOVERNMENT HELP

For a year, R/C continued at Wherle and Young; then someone's "flyaway" went through a picture window in the neighboring town. This led tc a migration from field to field that finally ended at a flying site that was provided by the county; it's still maintained, some 30 years later.

The Erie County Model Flying Site was one of the first government-sponsored facilities of its kind. It was followed by similar sites in the adjacent counties of Niagara and Monroe—most of which are still in operation.

It didn't take much effort to obtain these flying areas. When a county recreation director was approached, his

Early Flying Bisons member George Fadel prepares his C-S 465-equipped LW Senior for flight. Those 465 systems were a godsend to the non-electronic people.

Doing what he was renowned for, Bob assists fellow modeler Dick Evett with his Stormer.

reply was usually, "This department is here to fill the needs of all residents. Just tell us what you require." We were amazed! The AMA now offers guidelines for securing flying fields; if you need help, do inquire!

BUFFALO R/C CONFERENCE

Every club has its "workers," and the outstanding Flying Bisons were Jim Moynihan, Harold Keller, Don Hobel and Jack Roth. Tom Kerr and Fran Ptaszkiewicz developed the club insignia.

When the Detroit R\C Club announced the first of what went on to become the Toledo Show, the Flying Bisons were quick to recognize the merit of the idea. As a result, in January 1958, the Buffalo R/C Conference was organized. The first gathering was held in an unheated school auditorium, so you can imagine the frosty atmosphere! Cold aside, the die had been cast. Jim Moynihan stepped forward to manage the Conference for the 15 years of its existence. After the inauspicious start, the Conference was held in airport hotels that had excellent accommodations.

The Buffalo Conference attracted a wide variety of R/C enthusiasts. In addition to the commercial exhibitors, notables included Howard McEntee, Bill Winter, Walt Good, Walt Schroder, Bob Dunham, Ed Kazmirski, Ron Chapman and Ed Izzo. The Conference also attracted many Canadians.

As you might suspect, conference bills are paid by commercial exhibitors. As the Toledo Show grew and the WRAM (Westchester Aero Modellers) Show became more popular, manufacturers were hard-pressed to attend them all. Unfortunately, many manufacturers were forced to ignore one show, and Buffalo felt the brunt of it.

That did not, however, spell the end. Homebound winter modelers found good times in Buffalo's social atmosphere, which continued yearly. Then the cost of the facilities overwhelmed the Flying Bisons, and that brought

A LONG-OVERDUE TRIBUTE

There are those who made their mark in R/C conspicuously, and there are others who worked hard with little fanfare.

One of the quieter types, Art Schroeder, was honored at the 1995 WRAM show. He received the McEntee Memorial Medal and was inducted into the R/C Hall of Fame. One might ask, "How come it took so long?"

A schoolmaster by profession, Art also served as editor of *Model Airplane News* for several years after Walt Schroder left. He also found time for the AMA—in which he served as vice president—and chaired numerous committees. The list of his accomplishments is impressive and extensive! Like many others, Art switched to R/C in 1952, and his guidance has served the hobby well.

One prominent paper was the North Jersey R/C Club's "Printed Circuit" newsletter, which Art edited for a long time in those early days. One issue had 25 pages devoted to R/C activities and technical topics—a major effort for anyone, and it went on for years.

VR/CS president, John Worth, presents Art Schroeder with his VR/CS R/C Hall of Fame plaque and McEntee Memorial Medal award at the '95 WRAM Show.

When we envisioned the Vintage R/C Society (VR/CS) and needed leaders for it, Art became the newsletter editor; he produced one first-class edition after another. If you aren't a VR/CS member, you don't know what you're missing!

Always an active builder and flier, Art entered R/C in the "gas tube" era and progressed through the "pulse styles" on to propo and to today. He has built kits and originals, and he loves anything new or challenging. He's noted for having demonstrated the in-line principle for pattern design back in '68 (with his "Eyeball"). We see the value of the principle today in the many "Laser-Xtra" types that dominate contests.

Without Art Schroeder, R/C and modeling wouldn't be what they are today. We tip our hat to this distinguished gentleman for his unselfish work in R/C; he's one fine modeler!

Good-bye, Bob

I recently received a phone call from John Brodbeck who said that our messages to Bob Dunham were gratefully received. Bob's lovely wife, Yoko, said that the letters soothed his last days. We lost this outstanding modeler, friend to many and fine gentleman on April 12. Bob will always be one of R/C's legends.

about the demise of the Conference.

Buffalo's population is very large. With time, modelers found it convenient to form local clubs that drew from the Flying Bisons members. Without new blood, the Bisons became a small group of "old timers" (an unfortunate ending for what had been one of the nation's leading AMA clubs).

Clubs now in the Buffalo area are the Radio Control Aircrafters, the Hamburg Flying Knights and the Niagara Model Aircraft Club. Included among their many members are many of the original Flying Bisons—still active!

And so it was; multiply this club by the thousands, and you'll have R/C today—just great! ■

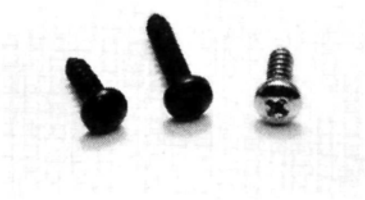
HOW TO

Scale Fasteners and Miniature Details

...and where to find them

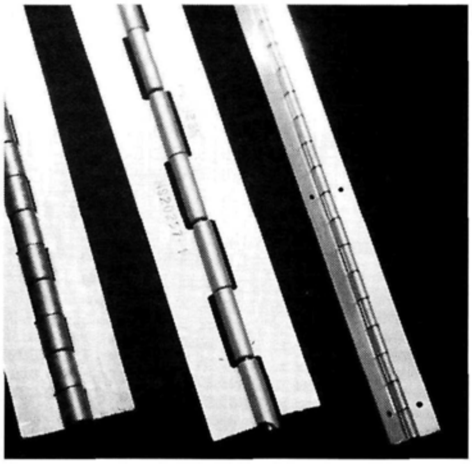
by JIM SANDQUIST

WHEN I built my first truly scale project, one of the biggest challenges was duplicating the many types of fastener that were on the plane. I spent a great deal of time looking for sources; with this article, I hope to provide some shortcuts for those of you who want to detail your planes.



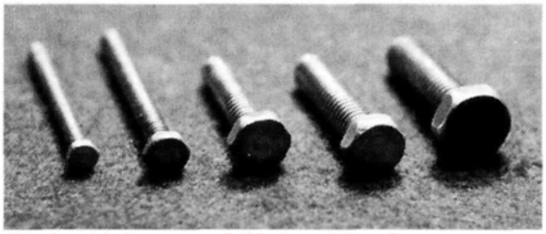
Nelson Aircraft Supply sells plated and non-plated no. 1 screws. These are great for securing windshields and piano hinges.

• **Screws and washers.** Hardware stores often provide a good stock of no. 2 and no. 4 flat-head machine screws and washers that duplicate dzus fasteners well, but most stores don't offer the no. 1 screws and smaller. Jerry Nelson's Nelson Aircraft Co.* offers a variety of screws from no. 1 on down in size. These include machine, pan-head, flat-head and Phillips-head screws. Jerry also carries a number of nylon screws, which are great for keeping weight down. No. 1 screws are good to use on windshields and hinges in 1/4-scale birds. I recently needed some very small piano hinges for a 1/4-scale L5-B. Jerry had a variety of them to fit aircraft of almost any size. In addition to hinges and screws, he also offers items such as drain grommets, flying wires, subminiature stop nuts and 4130 steel strap and steel tubes to make flying-wire attachments and landing gear. There's a catalogue.



Hinges are available in many sizes from Nelson Aircraft Supply.

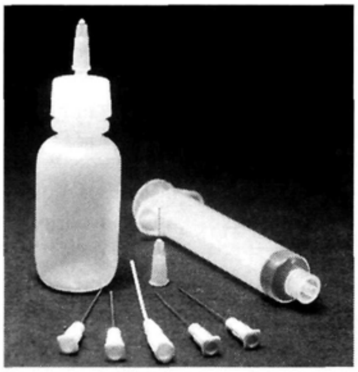
• **Hex-head bolts.** Another item that's difficult to duplicate is the hex-head bolt. The best source of these is Micro Fastener*. The bolts look just like standard hex bolts and are available in sizes from 2-56 to 10-32. The smaller ones come in steel and brass. A catalogue is available on Micro Fastener's product line.



Hex-head bolts are available from Micro Fastener in sizes from 2-56 to 10-32.

Du-Bro* button-head screws make great scale fittings and are available at most hobby shops.

If you don't want to make your own flying wires, Nelson Aircraft imports the most realistic wires and clevises available; they're custom-made to fit your plane.

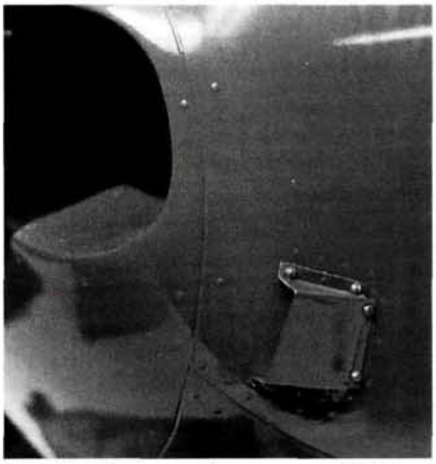


Small Parts Inc. sells a line of bottles and syringes that accept a variety of Luer Lock tips. They're excellent for making glue-drop rivets in a variety of sizes.

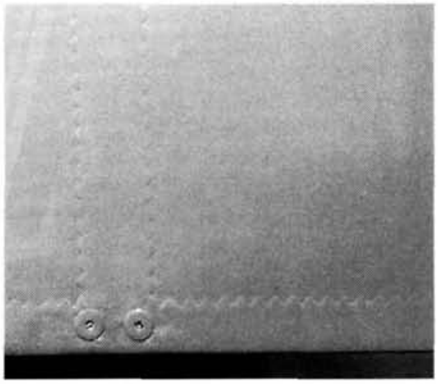
This shot of the author's L5-B shows how the combination of scale hinges, screws, pinking tape and glue-drop rivets can dress up an otherwise drab window.

PHOTOS BY JIM SANDQUIST

SCALE FASTENERS & MINIATURE DETAILS



Glue-drop rivets, small screws, no. 1 flat-head machine screws and panel lines make the author's cowl look real.



To allow moisture to escape, drain grommets were added to fabric-covered airplanes. These are available in ¼ and ⅓ scale from Nelson Aircraft.

• **Rivets.** Information on rivets and ways of replicating them using aliphatic glue have filled magazines, but I've always had trouble finding a good glue applicator. Now, to make rivets in virtually any size you could want, Small Parts Inc.* offers Luer Lock bottles and syringes with a wide variety of stainless-steel, reusable tips. Order a catalogue to see the variety of fasteners and hobby tools that are also available.

Making scale fittings and fasteners requires imagination as well as effort (hunting through stores). I found pinking tape at a local drugstore and, although it's really hair-setting tape, it looks great on ¼-scale models. Visits to a local surplus salvage store have yielded excellent landing lights, wheels and ultra-small bulbs and wire for scale detailing.

Keep your eyes open, and use some imagination; it could be the difference between an average model and an extraordinary one!

Addresses are listed alphabetically in the Index of Manufacturers on page 138. ■

HOW TO

Cover a Streamlined Cowl

by FAYE STILLEY

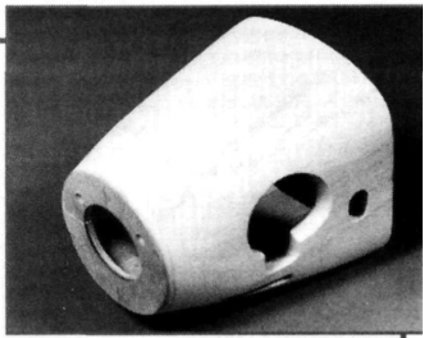
Compound, curved surfaces, such as this streamlined cowl, can be covered so smoothly that they appear to have a professional paint job.

Editor's note: in the June and July '95 issues, Faye explained how to design and build a streamlined cowl.

1

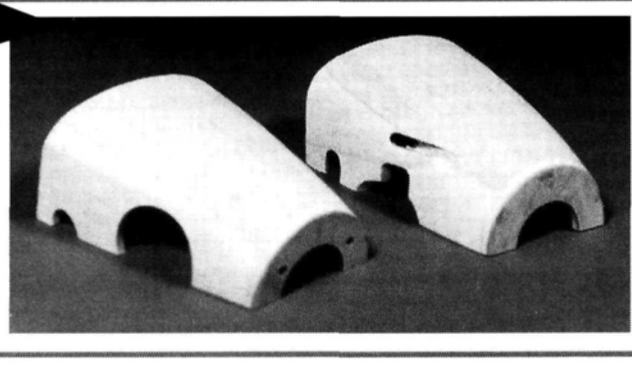
Because the covering must be ironed onto the wood, the surface must be carefully prepared. I recommend a final sanding with 600-grit sandpaper but, for superior results, use 1,000 grit. In either case, use a sanding block so that you don't sand away the softer wood and leave high spots where the grain is harder.

2



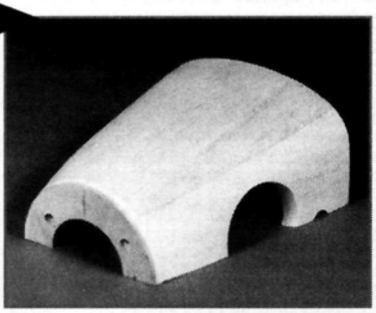
The cowl's shape provides some clues about how to handle the covering. The front is round where it meets the spinner; the rear is "squarish" with rounded corners; and there are openings on the sides where the engine components will protrude. Also, the cowl is separated into an upper half and a lower half. These observations would send many modelers off to find a paint that matches the fuselage color, but paints are messy and require a lot of work, and it's often hard to match colors.

3



There's no need for paint! You can cover this cowl with the same covering that you used on the fuselage. That the cowl separates into halves gives you a break (no pun intended), because it allows you to cover without making seams. The halves have different shapes. The upper half (left) is mildly tapered from the rear to the front on the sides and on the top; the lower half is similarly tapered at the rear and on the sides, but the curve from front to rear on the bottom is much more severe. The techniques for covering this area will be similar—but different!

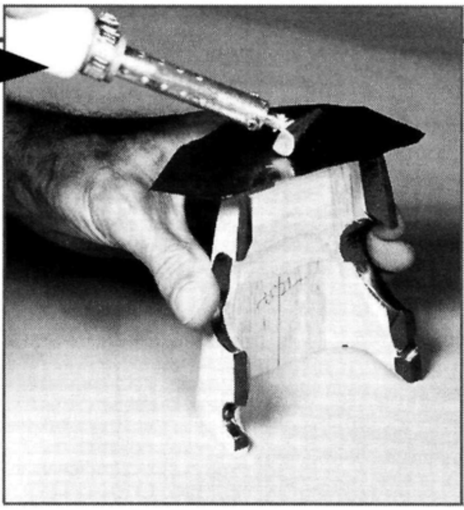
4



By analyzing the shape, you can anticipate what will be required for a smooth covering job. Here are some of my observations:

- The top is more curved than the sides, so it will take more covering.
- To prevent wrinkling on the sides, the covering will have to be shrunk.
- The nose (front) is much smaller than the rear, and both the top and sides taper in dramatically as they approach the nose.
- A lot of excess will have to be removed.
- To minimize the excess on the sides and on the front, the top covering should be stretched as much as possible—from front to rear—as it's applied.

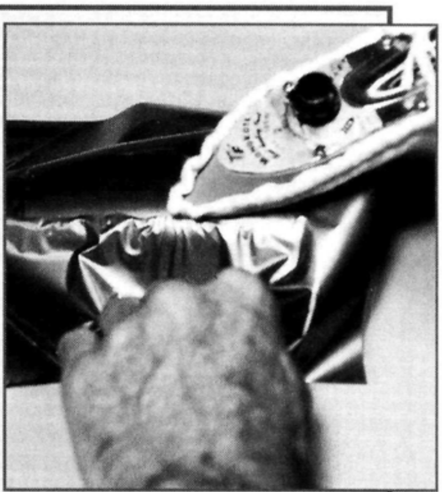
5



Let's proceed. First, cover the flat end surfaces and the edges all the way around so that you'll have a good, clean surface on which to attach the outer covering. This also ensures that the edges of the outer covering seams face inward for better fuelproofing. If the edges and the ends were covered after the outer covering had been put into place, the raw edges at the seams would face out, making them more susceptible to fuel damage and also very visible.

6

First, cover the highest point of the cowl's curve. In this case, it's the center line from front to back. The covering is attached at the midpoint between the front and the back. Then, while you're stretching it fore and aft, iron the covering into place. Stretching it over the highest point eliminates some of the excess that will have to be dealt with on the side sections. Smooth the covering from the center line toward each side, as far as it will go, without making wrinkles. An iron set at about 230 degrees works well.



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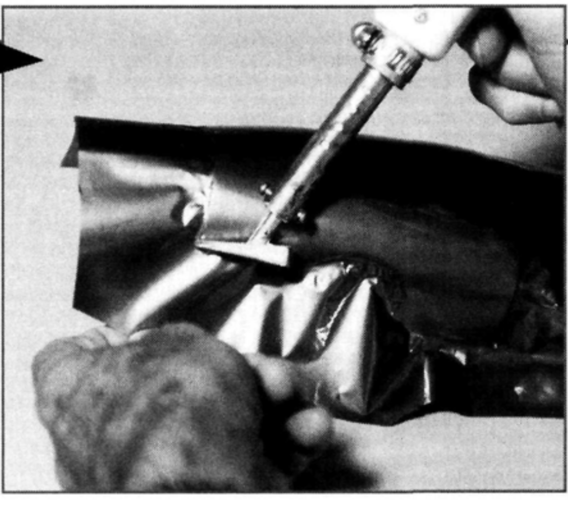
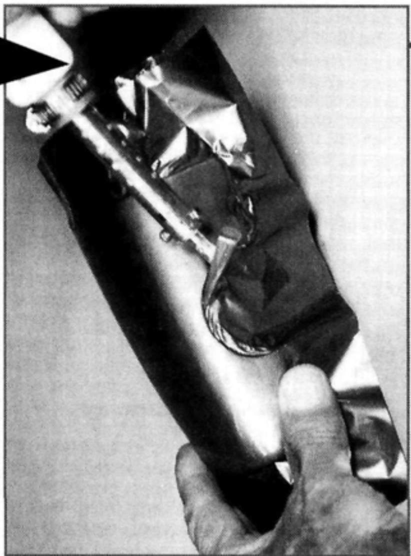


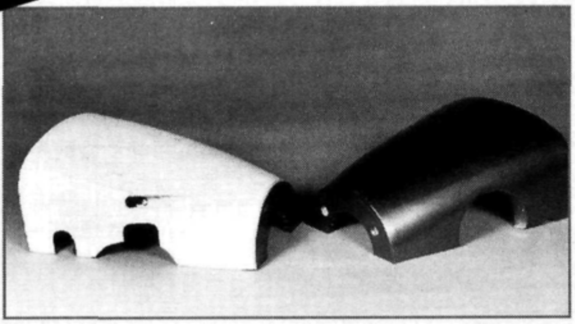
Before you iron the covering onto the sides, you'll need a higher temperature to shrink the excess. I use the small trim iron with the rounded shoe so that I can see how the covering reacts as I apply heat. Push the shoe as far as possible into the barrel of the iron. This provides you with maximum heat when you set the iron on high. Hold the covering away from the surface, and heat it with the iron. When it shrinks and becomes rubbery, pull it down onto the surface, and pass the iron over it, using very little pressure. Hold the covering in place for a few seconds to allow the adhesive to cool and set. If you let go while the adhesive is still hot, the covering can pull away from the surface. Work in small strips, or rows, from the center to the front and then to the rear. Pull the covering toward the end of the cowl, down over the sides and away from the center toward the front or rear end. This removes more of the excess covering. After you've made several passes from the center to each end, the side will be finished.

8



Using the heat iron, push the covering into the openings as far as you possibly can before you cut it. This action ensures a good, tight seal at the edges. Cut the covering to relieve the stress, pull it into the openings, and seal it. The upper half of the cowl is now trimmed and finished.

9

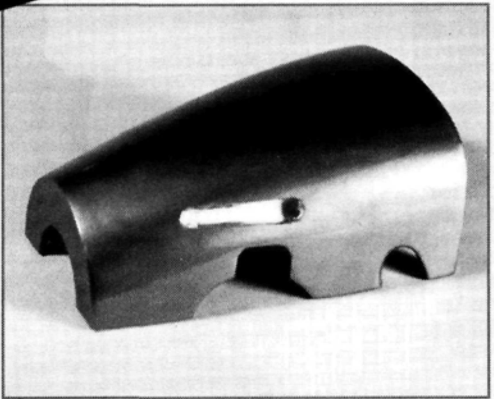


The lower half (left) is ready to be covered. The difference between the shape of this section and that of the upper half is particularly apparent in this photo. Observing the lower half closely, you can see that the front/rear curve is longer along its center line than the upper half. The covering will have to be stretched more—fore and aft—than was required on the upper half. Also, more excess material will accumulate toward the front because of the greater curve. No sweat! We know what to expect, and we can compensate for it!

10

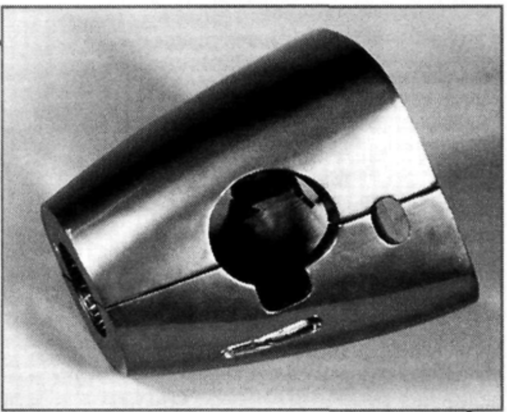
When you've covered the curve's high point, you'll have to stop smoothing out the covering with the large iron earlier than when you were working on the upper half. The material will begin to wrinkle higher up on the side because the curve drops off more severely. Change to the small iron again, and proceed as you did in step 7—just do it sooner. To adjust for the excess material, make narrower passes with the iron, fore and aft. The opening near the center of the cowl is helpful because you can pull the excess into it. As you might imagine, the time required to complete the covering increases in proportion to the severity of the curve.

11



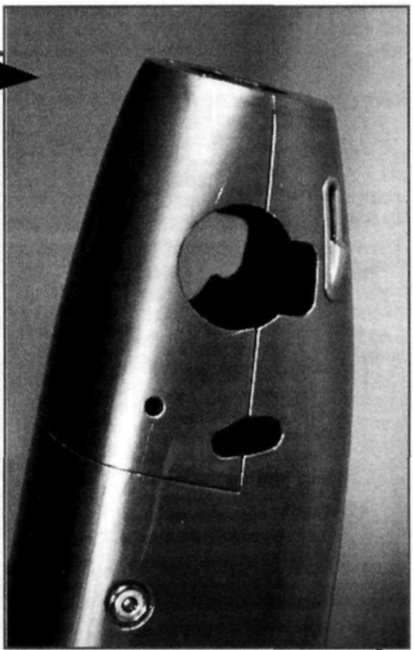
The lower half is finished off in the same way as the upper half. The covering is pulled over the edges of the openings and sealed to the covering that was applied earlier. The bare spot in the lower half, where the wood shows through, is an opening for an air scoop. The air scoop is actually a pushrod exit guide, installed with the open end facing forward (visible in photo 13).

12



With the upper and lower halves joined, the difference between the two shapes is now highlighted by light reflections. The interior of both halves should be covered with light fiberglass, or at least a polyester resin to increase strength and make them fuelproof. The resin should overlap the covering's inner edge to form a permanent seal. Painting the inside of the cowl with a flat, black, fuelproof paint gives a finished appearance.

13



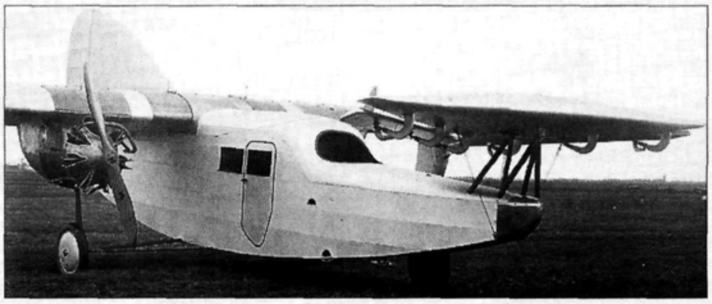
Here, the finished cowl is attached to the fuselage and is ready for the engine installation. Its color matches that of the fuselage perfectly because the same covering has been used.

The time required to finish the cowl using covering is probably about half as long as it would take for a good paint job. ■

NAME THAT PLANE

CAN YOU IDENTIFY THIS AIRCRAFT?

If you can, send your answer to *Model Airplane News*, **Name That Plane Contest** (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.



CONGRATULATIONS to Karl H. Klaus of Paxinos, PA, for correctly identifying the June '95 mystery plane. The Focke-Wulf Fw 44 Stieglitz was used by the Luftwaffe for training and aerobatics. It was made of welded-steel tubes, plywood, pine and duralumin. The Fw 44 was covered with fabric and had some areas covered with plywood or metal for strength. The aircraft had a 29-foot, 6-inch wingspan and was 23 feet, 11 inches long and 8 feet, 10 inches high with a wing area of 215 square feet. The powerplant was a 150hp Siemens Sh. 14a radial air-cooled engine, and the fuel capacity was 30.8 gallons, 8.8 of which were stored in a lower tank to help supply fuel for inverted flight. The empty weight was 1,166 pounds, and the gross weight was 1,892 pounds. The maximum speed at sea level was 116.7mph, and the cruising speed was 108mph. Its landing speed was 45.9mph, and the plane had a service ceiling of 14,432 feet with a range of 357 miles.

The winner will be drawn four weeks following publication from correct answers received (on a postcard delivered by U.S. Mail), and will receive a free one-year subscription to **Model Airplane News**. If already a subscriber, the winner will receive a free one-year extension of his subscription.

CLUB OF THE MONTH

D.C. RADIO CONTROL CLUB

6208 Hollins Dr., Bethesda, MD 20817

In the June issue of the District of Columbia Radio Control Club's newsletter, club president Andy Kane applauds the improvements and additions to their flying field—an improved gazebo, helicopter tables, work tables and benches and a new transmitter-impound area.

In Part 10 of his "Engine Design" series, Art Kresse provides drawings of engines and tells how to make jigs and fixtures; and Roy Day offers some alternative wingtip designs in "More on Wingtip Construction." In "Flight Training," Daniel Reardon describes how Dave Scott—director of the first U.S. R/C flight school—taught Daniel's two sons to fly R/C. They were able to land on their third flight and solo on their 12th! Patrick Hoff provides an interesting perspective in "First Flight"—an essay about the first time he flew a brand-new plane.

In addition to pylon-racing events, pattern contests and fun-scale and giant-scale fly-ins, this active club plans to take a "field trip" to Freewing Aerial Robotics in College Park, MD, where engineers and aerodynamicists are developing piloted and unpiloted aircraft with unconventional hinged wings.

The D.C. fliers are also interested in sharing the hobby with others and expanding their membership. At the club's first flight-instruction session of '95, 15 students made approximately 45 flights, and at a recent club meeting, members presented "Tips for Beginners," which included a discussion of ARF kits, radios and safety at the field.

For their commitment to improving their flying site and introducing newcomers to R/C, we award the club two complimentary subscriptions to *Model Airplane News*. Congratulations! ■

video views

by JEF RASKIN

THE 1994 INTERNATIONAL SLOPE RACE

Subject: *America's premier slope race*
Source: *Tallant Productions, 6922 Hutchins Ave, Sebastopol, CA 95472-4539; (707) 823-3534.*
Summary: *thrills, spills and nose-to-nose racing action*
List price: *$24.95 (plus $5 S&H; CA residents, add 7.5% tax)*
Rating: ✈ ✈ ✈
Approximate length: *120 minutes*

This is one of the most exciting model-airplane events, yet few modelers have had the privilege of watching these planes in action. Sailplanes? Racing? Absolutely. Remember that the absolute model airplane speed record has been held for years not by a highly tuned, carefully piped, glow-engine-powered racer, not by a screaming jet, but by a sailplane! These aren't the slow, gentle "floaters" that come to mind when we think of R/C sailplanes but hairy, all-out go-mobiles. It takes high tech to give them the definitive whoosh! of speed. Vacuum-bagged, carbon-fiber wings; pencil-thin fuselages for minimal drag; sealed gaps on their flaps, ailerons, elevators and rudders; and exotic shapes mark these wonders, which can cost more than $1,000 to get into the air. They need those flaps; I've flown slope racers and, without flaps, it's hard to get them to slow down enough to land! By the way, my last one did 120mph down the straights, and it wasn't even competitive.

The rules are pretty simple: fly back and forth five times between two points as fast as possible. Four planes typically make up a heat, and you get points in proportion to your time. The winner gets 1,000 points, and everybody else gets points in proportion to his time relative to the winner's time. You get 500 points if you flew but did not finish the heat. To start, the planes are all launched, have 60 seconds to gain altitude and then make a diving start to an audible countdown. The idea is to cross the line in a dive at maximum speed just after you hear "zero." It takes practice.

When you have four planes flying a tight course and passing one another at relative speeds of more than 200mph, crashes can be dramatic, and this tape has captured them. But, mostly, you get to see the important heats and the exciting fly-off from beginning to end—unedited. And that's the only negative about this tape: perhaps it has a few too many heats shown in full, though racing fans will love every minute. Some were narrated; I wish they all had been. I would have preferred more about the planes and the flying techniques with a video of construction details and operation of the many moving parts. What makes one glider go faster than another? Clearly, high aspect ratio is one factor (short, jet-like wings don't work here), and flying smoothly is another, but there is more to it, and I would have liked it if the experts had shared more of their knowledge.

There is some fine sportsmanship exhibited by the fliers, and the finish is dramatic enough to have come from a script writer. If you like speed, beautiful scenery and model airplanes, you can't go wrong with this first-ever, slope-racing video.

15TH ANNUAL KRC ELECTRIC FLY

Subject: *America's premier electric event*
Source: *KRC Video, c/o John Hickey, 1624 Maple Ave., Hatfield, PA 19440.*
Summary: *a well-done view of electrics in the air*
List price: *$23 (includes postage and handling in the U.S.)*
Rating: ✈ ✈ ✈ ✈
Approximate length: *112 minutes*

My own club has been all-electric for a few years now, and we don't miss the messy motors we used to fly. While there are still a few niches where liquid fuels excel, electrics can do almost anything. Now they have the performance (you can build an electric with more thrust than weight for pure vertical operation), the duration (½-hour motor runs are not impossible) and the availability once offered only by smoke-breathing power systems. And, as this video shows, electric planes can weigh *less* than their glow-engine counterparts.

The KRC Electric Fly is the most venerable and the biggest of our nation's electric events. Held annually in Pennsylvania, no event attracts more electrifying entrants. You name it, they fly it—scale, duration, speed, aerobatics, ducted fans, flying wings, anything.

Because this video is full of memorable people, fine flights and exciting planes, electric fliers will find inspiration and confirmation of what they already know. If you haven't been bitten by the electric bug yet, then this tape will give you eye-opening reasons to give electric flight a try. ■

INDEX OF MANUFACTURERS

Ace R/C Inc., 116 W. 19th St., P.O. Box 472, Higginsville, MO 64037-0472; (800) 322-7121; fax (816) 584-7766.

Aeroplane Works, 2134 Gilbride Rd., Martinsville, NJ 08836; (908) 356-8557.

Aerotech Models Inc., 2740 31st Ave. S, Minneapolis, MN 55406; (612) 721-1285; fax (612) 721-1181.

Airtronics Inc., 11 Autry, Irvine, CA 92718; (714) 830-8769.

Astro Flight Inc., 13311 Beach Ave., Marina Del Rey, CA 90292; (310) 821-6242; fax (310) 822-6637.

Aveox, P.O. Box 1287, Agoura Hills, CA 91376; (818) 597-8915; fax (818) 597-0617.

Byron Originals, P.O. Box 279, Ida Grove, IA 51445; (712) 364-3165; fax (712) 364-3901.

C.H. Electronics, P.O. Box 1732, Riverton, WY 82501; phone/fax (307) 857-6897.

Coverite, 420 Babylon Rd., Horsham, PA 19044; (215) 672-6720; fax (215) 672-9801.

Cox Hobbies, 350 W. Rincon St., Corona, CA 91720; (909) 278-1282; fax (909) 278-2981.

Don Smith Plans, 219 Goolsby Blvd., Deerfield Beach, FL 33442; 305-570-7551.

Du-Bro Products, 480 Bonner Rd., P.O. Box 815, Wauconda, IL 60084; (708) 526-2136; fax (708) 526-1604.

Eagle Aviation, 4573 Lamme Rd., Dayton, OH 45439; phone/fax (513) 296-1290.

FAI Model Supply, P.O. Box 3957, Torrance, CA 90510; (310) 830-8939.

Frank Tiano Enterprises, 15300 Estancia Ln., W. Palm Beach, FL 33414; (407) 795-6600; fax (407) 795-6677.

Futaba Corp. of America, P.O. Box 19767, Irvine, CA 92713-9767; (714) 455-9888; fax (714) 455-9899.

Gerard Ent. W226 N825 Eastmound Dr., Waukesha, WI 53186; (414) 521-0547; fax (414) 521-0551.

Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.

Harry Higley & Sons Inc., P.O. Box 532, Glenwood, IL 60425; (708) 755-8774.

Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; fax (615) 377-6948.

Horn-Dog Aircraft, P.O. Box X, Torrance, CA 90507.

House of Balsa, 10101 Yucca Rd., Adelanto, CA 92301; (619) 246-6462; fax (619) 246-8969.

JR Remote Control; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511; fax (217) 355-8734.

K&B Mfg., 2100 College Dr., Lake Havasu City, AZ 86403; (602) 453-3579.

KT Aviation, 5913 Premiere Ave., Lakewood, CA 90712.

Lanier RC, P.O. Box 458, Oakwood, GA 30566; (404) 532-6401; fax (404) 532-2163.

Micro Fasteners, 110 Hillcrest Rd., Flemington, NJ 08822; (908) 806-4050; fax (908) 788-2607.

Midwest Products, P.O. Box 564, Hobart, IN 46342-0564; (219) 942-1134; fax (219) 942-5703.

Moki; distributed by Gerard Enterprises (see address above).

MonoKote; distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104.

Nelson Aircraft Supply, 21550 N.W. Nicholas Ct., Unit D, Hillsboro, OR 97124; (503) 629-5277; fax (503) 629-5817.

Nick Ziroli Models, 29 Edgar Dr., Smithtown, NY 11787; (516) 467-4765; fax (516) 467-1752.

Northeast Sailplane Products, 16 Kirby Ln., Williston, VT 05495.

Ohio R/C Models, 4251 Lutheran Church Rd., Germantown, OH 45327; (513) 859-1660; fax (513) 859-7202.

Pica/Robbe Inc., 2655 N.E. 188th St., Miami, FL 33180; (305) 932-1575; fax (305) 937-2322.

Precision Aviation, 1822 6th Ave. W, Bradenton, FL 34205.

Precision Fiberglass Products, 2805 Big Bend Dr., Maryville, TN 37803; (800) 753-8468.

Rev-Up; distributed by Progress Mfg. Co., P.O. Box 1306, Manhattan, KS 66502.

Robart Mfg., P.O. Box 1247, St. Charles, IL 60174; (708) 584-7616; fax (708) 584-3712.

Sanyo Energy Corp, 2001 Sanyo Ave., San Diego, CA 92173; (619) 661-6620; fax (619) 661-6743.

Satellite City, P.O. Box 836, Simi Valley, CA 93062; (805) 583-0994.

Scale Model Research, 3114 Yukon Ave., Costa Mesa, CA 92626.

Sig Manufacturing Co. Inc., 401-7 S. Front St., Montezuma, IA 50171; to order, call (800) 247-5008; inquiries: (515) 623-5154; fax (515) 623-3922.

Slegers Intl., Rt. 15, Wharton, NJ 07885; (201) 366-2525; fax (201) 366-0549.

Small Parts Inc., 13980 N.W. 58th Court, P.O. Box 4650, Miami Lakes, FL 33014-0650.

SR Batteries, Box 287, Bellport, NY 11713; (516) 286-0079; fax (516) 286-0901.

SuperTigre; distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104.

Tower Hobbies, P.O. Box 9078, Champaign, IL 61826-9078; (800) 637-4989; fax (800) 637-7303.

Ultracoat; distributed by Carl Goldberg Models, 4734 W. Chicago Ave., Chicago, IL 60651; (312) 626-9550; fax (312) 626-9566.

Webra; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511; fax (217) 355-8734.

Wendell Hostetler, 1041 Heatherwood Ln., Orrville, OH 44667; (216) 682-8896.

Zap; distributed by Pacer Technology, 9420 Santa Anita Ave., Rancho Cucamonga, CA 91730.

Zenoah; distributed by Indy R/C, 10620 N. College Ave., Indianapolis, IN 46280; (317) 846-0766; fax (317) 848-1015.

Zinger; distributed by J&Z Products, 25029 Vermont Ave., Harbor City, CA 90710.

Ziroli (see Nick Ziroli Models).

ADVERTISING INDEX

PRODUCT NEWS

HOBBY LOBBY INTL. INC.
Donald 4

This electric sailplane has a white fiberglass fuselage/hull and framed-up wings that are ready to be covered. Water handling is facilitated by a water rudder and two wing floats that are attached to the wing with rubber bands. If you want to convert it into a land plane, the plans show landing-gear installation. Specifications: wingspan—55 inches; wing area—428 square inches; weight—49 to 53 ounces; motor required—GR3316 on 7 or 8 cells; radio required—3-channel.

Part no.—HLOB004; **price**—$189.

Hobby Lobby Intl., 5614 Franklin Pike Cir., Brentwood, TN 37027; (615) 373-1444; (615) 377-6948.

MIDWEST PRODUCTS INC.
Super Stinker 11-260

This 27-percent-scale model is Curtiss Pitts' latest creation. The kit features rugged, jig-lock construction and die-cut lite-ply and balsa parts. Bent and drilled aluminum landing gear, cabane struts, an ABS cowl, wheel pants and a clear canopy are included, and computer-drawn plans and a 3-D illustrated manual help with construction. Specifications: wingspan—60 inches; wing area—1,240 square inches; weight—12.5 to 16 pounds; engine required—1.08 to 1.8 2-stroke, or 1.5 to 3.0 4-stroke; radio required—4-channel.

Part nos.—182 (kit), 1094 (instrument panel); **prices**—$374.95, $24.95.

Midwest Products Inc., P.O. Box 564, Hobart, IN 46342-0564; (219) 942-1134; fax (219) 942-5703.

MODEL TECH
P-51D Mustang 60

This built-up, hand-crafted plane is hand-sanded and comes ready for final assembly and covering. Wing construction is D-tube and balsa sheeting over balsa ribs with capstrips. The kit includes a molded fiberglass chin cowl, wing fairing, clear canopy and photo-illustrated instructions and hardware. Specifications: length—54 inches; wingspan—64 inches; wing area—770 square inches; engine required—.60 to .90 2-stroke, or .90 to 1.20 4-stroke; radio required—5- or 6-channel.

Part no.—123645; **price**—$340.

Model Tech; distributed by Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, VA 92728-8610; (714) 963-0133; fax (714) 962-6452.

JR
Extra Batteries

JR's new line of 4- and 5-cell battery packs are made of premium-quality Sanyo E-series cells and have extended capacity and a linear discharge curve that can easily be monitored. They're quadruple-welded rather than soldered, and for durability and low resistance, they use extra-heavy-gauge wire. Gold-plated connectors and double-thickness heat-shrink wrap complete the package.

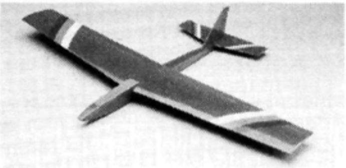
JR; distributed by Horizon Hobby Distributors, 4105 Fieldstone Rd., Champaign, IL 61821; (217) 355-9511; (217) 355-8734.

LDM INDUSTRIES INC.
Combat Fighter Series

These stand-off-scale models are designed to compete in the new Open R/C Combat contests. Every kit features a tough, rubberized PVC fuselage extrusion, balsa tail surfaces and foam-core wings, and they all come with pushrods, clevises, hinges, wing bolts, control horns, torque rods and all the necessary screws. Specifications: length—37 to 38 inches; wingspan—44 to 48 inches; wing area—510 to 520 square inches; weight—4.25 to 4.5 pounds; engine required—.40 to .46 2-stroke; radio required—4-channel.

Part nos.—4010 (A-10 Warthog), 4015 (F-15 Eagle), 4016 (F-16 Falcon), 4018 (F-18 Hornet); **price**—$39.95 (plus $5 S&H).

LDM Industries Inc., P.O. Box 292396, Tampa, FL 33687-2396; (813) 991-4277; fax (813) 991-4810.



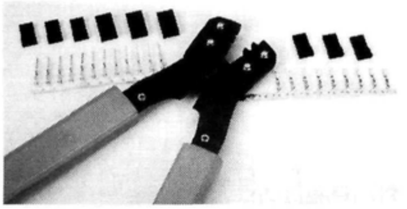
HOBBY SHACK
Firebird

This slope glider comes with completely built wings that have been joined with fiberglass and covered with four Ultracote colors. You only need to glue on the tail surfaces and install your receiver, and you're ready to soar! The Firebird will fly in all types of lift and has great aerobatic performance. The kit comes with all the necessary hardware and instructions for final assembly. Specifications: wingspan—58.5 inches; wing area—527 square inches; radio required—3-channel.

Part no.—123700; **price**—$99.99.

Hobby Shack, 18480 Bandilier Cir., Fountain Valley, CA 92728-8610; (714) 964-0827; fax (714) 962-6452.

PRODUCT NEWS



CUSTOM ELECTRONICS

Connectors and Crimping Tool

Now you can make aileron extension cables and replace servo connectors without having to solder. Simply crimp these pins onto your wires, then snap the pins into the plastic housings. Unassembled radio connectors are sold in sets of four, and the crimping tool works on 20 to 28AWG wire.

Part nos.—CEL1179 (crimping tool), CEL1171/CEL1175 (Futaba J male/female), CEL1172/CEL1176 (JR male/female), CEL1173/CEL1177 (Airtronics male/female); **prices**—$24.95, $9.50/set male, $9.95/set female.

Custom Electronics, RR1 Box 123 B, Higginsville, MO 64037; (816) 584-6284; fax (816) 584-6285.

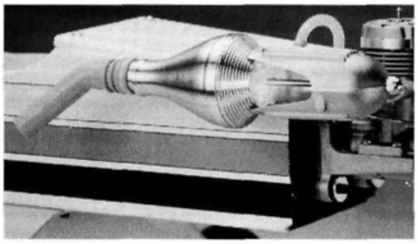
GREAT PLANES

.60-size Cub

Interlocking, CAD-engineered parts, shaped leading edges, pushrod routing holes and authentic scale details make this kit easy to build. The wing is built in one piece for extra strength and has functional wing struts with custom-molded fittings. Most of the model is covered in balsa. Specifications: wingspan—90 inches (standard), 83 inches (clipped); wing area—1,123 square inches (standard), 1,037 square inches (clipped); weight—9.5 to 12 pounds; length—56.5 inches; engine required—.60 to .90 2-stroke, or .70 to .91 4-stroke; radio required—4-channel with five servos.

Part no.—GPMA0162; **price**—$219.99.

Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (217) 398-6300; fax (217) 398-1104.



DU-BRO

Extension and Exhaust Deflector

Designed for use with the Arise muffler, this extension will fit ASP, Magnum, O.S. and Thunder Tiger .40 to .46 engines; it comes with two 30x50mm screws. Du-Bro's new exhaust deflectors are made of heat-resistant silicone and will help to keep models clean and free of exhaust oils. The deflectors come with plastic ties.

Part nos.—699 (extension), 696 (deflector for .20 to .34 engines), 697 (deflector for .35 to .90 engines); **prices**—$4.50, $3.49, $3.49.

Du-Bro, 480 Bonner Rd., P.O. Box 815, Wauconda, IL 60084; (708) 526-2136; (708) 526-1604.

MAGNUM

Digital Mini-Tach

This small, ergonomic mini-tach features large, ½-inch-high LCD numbers that are tilted toward you so they can be read easily. To "steady" fluctuations in the speed of the engine, the rpm reading is cut off at the nearest 100rpm; the device can also read the rpm of 2- and 3-blade props with the flick of a switch. The Magnum Digital Mini-Tach comes in a case that has non-slip ribbing and tapered edges to fit more naturally into your hand.

Part no.—360880; **price**—$49.95.

Magnum; distributed by Global Hobby Distributors, 10725 Ellis Ave., Fountain Valley, CA 92728-8610; (714) 963-0133; fax (714) 962-6452.

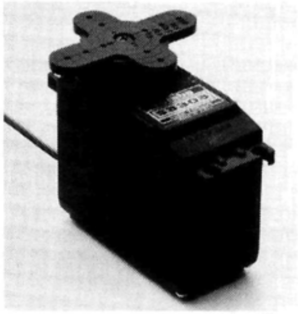
ACE R/C

Simple Series Ultimate

Injection-molded foam wings, lite-ply and balsa make up this sturdy, light model. The Ultimate can perform sustained vertical rolls, snaps and perfect touchdowns. Specifications: wingspan—33 inches; wing area—396 square inches; length—28½ inches; weight—28 to 34 ounces; engine required—.10 to .20ci; radio required—4-channel.

Part no.—50K245; **price**—$54.95.

Ace R/C, 116 W. 19th St., P.O. Box 472, Higginsville, MO 64037-0472; (800) 322-7121; fax (816) 584-7766.



FUTABA

FP-S3303

This powerful servo is well-suited to ¼-scale and other high-torque applications. Specifications: dimensions—1.14x2.32x 1.97 inches; weight—3.8 ounces; torque—194 oz.-in.; transit time—0.26 second (60 degrees).

Futaba Corp. of America, P.O. Box 19767, Irvine, CA 92713-9767; (714) 455-9888; fax (714) 455-9899.

Descriptions of products appearing in these pages were derived from press releases supplied by their manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News**, nor does it guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News**. **Manufacturers!** To have your products featured here, address the press releases to **Model Airplane News,** attention: Product News, 251 Danbury Rd., Wilton, CT 06897.

CLASSIFIEDS

RATES: non-commercial—25 cents per word (no commercial ads of any kind accepted at this rate); commercial— 50 cents per word (applies to retailers, manufacturers, etc.); count all initials, numbers, name and address, city, state, zip code and phone number. **All ads must be paid for in advance.** To run your ad for more than one month, multiply your payment by the number of months you want it to run. Deadline: the 10th day of the month, 3 months in advance, e.g., *January 10 for the April issue.* We don't furnish box numbers, and it isn't our policy to send tear sheets. **SEND AD AND PAYMENT TO: Elise Silkowski, CLASSIFIED ADS, Model Airplane News, 251 Danbury Rd., Wilton, CT 06897-3035, or call (203) 834-2339.**

R/C WORLD ORLANDO, FL, CONDO RENTAL: 2 bedroom, furnished. Available weekly or monthly. Low rates. 100-acre flying field with enclosed hangars. Close to Disney World and Epcot Center. For information, please call or write to R/C World, 1302 Stearman Ct., Orlando, FL 32825; (407) 380-6359.

ENGINES: IGNITION, GLOW, DIESEL—new, used, collectors, runners. Sell, trade, buy. Send $3 for huge list to Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537 [11/95]

MODEL MOTORS WANTED—Most types, 1970 and earlier. Cash or trade. T. Crouss, 100 Smyrna, West Springfield, MA 01089 [9/95]

FLY DAVE BROWN SIMULATOR. Use your transmitter. Works with Futaba, JR, Airtronics, Hitec. Uses Standard joystick connection. For more info, contact Computer Designs, 8530 N. Montana Ave., Helena, MT 59601;(406) 458-9416. [1/96]

SODA-CAN AIRPLANES—replica biplane detail plans with photos $7.50 PPD, Early's Craft, 15069 Valley Blvd. SP 26, Fontana, CA 92335. [8/96]

CARS. *Selling model collection,* 1973 issues up, 1/24-1/25, individual prices, about 800. Ralph, Box 2423-P, Yakima, WA; (509) 965-0670 [11/95]

WANTED: Model engines and racecars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [10/95]

MAGAZINE BACK ISSUES—*American Modeler, American Aircraft Modeler, Aeromodeller, Model Airplane News, Model Aircraft, RCM* and more; 1930s–1990s. For list, send SASE to Carolyn Gierke, 1276 Ransom Rd., Lancaster, NY 14086. [9/95]

WANTED: ignition model engines 1930s to 1950s, especially Elf, Baby Cyclone, Brown Jr., Ohlsson Custom and Gold Seal. Also model racecars, any parts, spark plugs, etc; Woody Bartelt, 1301 W. Lafayette St., Sturgis, MI 49091; (616) 665-9693, or (800) 982-5464. [10/95]

PLANS TO BUILD more than 700 tools, machines and accessories for your shop. Catalogue–$1. Wood-Met. Dept. MAN, 3314 W. Shoff Cir. Peoria, IL 61604-5964. [9/95]

CASH FOR ENGINES: ignition, glow, diesel–all types; any condition; sale list, too! Estates my specialty! Send SASE for list. Bob Boumstein, 10970 Marcy Plaza, Omaha, NE 68154; (402) 334-0122. [11/95]

R/C SKYDIVNG-It's fun. It's different. It's a gravity-powered adventure! New, lower prices, new parachutes, *free* jump plane plans, etc., etc. Latest catalogue $1.00. R/C Skydivers, Box 662B, St. Croix Falls, WI 54024. [12/95]

WANTED: Model engines and racecars before 1956. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; (806) 622-1657. [12/95]

REPLICA SWISS WATCHES—18KT goldplated! Lowest prices! Two-year warranty! Waterproof! SubmDivers, DaytChronos, others! Phone (404) 682-0609; Fax (404) 682-1710.

WANTED: Old, unbuilt, plastic model kits from '50s and '60s. Send list, price to Models, Box 863, Wyandette, MI 48192. [2/97]

MICROLITE DETHERMALIZER .7 gram. Send large SASE to Wheels and Wings, P.O. Box 762, Lafayette, CA 94549-0762. [9/95]

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ENGINES, KITS & ACCESSORIES: 35-year collection for sale. For listing send #10 SSAE to: Ed Hagerlin, Box 1980, Overton, NV 89040. [2/96]

R/C FLIGHT TRAINING. Your training is fun and easy in far western North Carolina, near Murphy on your map. Write or call. R/C Flight Training, 120 Setawig Rd., Brasstown, NC 28902; (704) 389-8968. [9/95]

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1992 NATS VIDEO. Two-hour documentary includes R/C and C/L scale, C/L carrier, R/C helicopters, R/C pylon racing, C/L combat, Speed and aerobatics, free flight indoor and outdoor. Includes interviews with fliers and officials, Voice-overs and original music. $29 (S&H included), NY add 8.25% to: Alan Abriss Productions, 94-20 66th Ave., Forest Hills, NY 11374. [9/95]

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MODEL AIRPLANE NEWS, 1930-1980; "Air Trails," 1935-1952; "Young Men," 1952-1956; "American Modeler," 1957-1967; "American Aircraft Modeler," 1968-1975. $1 for list. George Reith, 3597 Arbutus Dr. N., Cobble Hill, B.C. Canada V0R 1L1. [2/96]

ANTIQUE IGNITION engine parts: excellent reproductions, fuel tanks, points, timers, coils, needle valves, gaskets, etc. Champion spark plugs. Catalogue—$5 (intl. airmail—$7). Aero-Electric, 1301 W. Lafayette St., Sturgis, MI 49091. [10/95]

GIANT-SCALE PLANS by Hostetler. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667.[12/95]

PLANS ACCURATELY ENLARGED or copied. Any scale, any size. Money-back guarantee. Send $2 for info and a customized poster for your shop. Roland Friestad, 2211M 155th St., Cameron, IL 61423. [12/95]

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VIDEOS: Top Gun '95, $24.95 plus S&H. Top Gun '94, R/C Know How, North Carolina Big Bird Fun Flys, Greenville NC Fun Fly. 2 hours. Send $19.95 plus $3 S&H to E&H Video, 134 Wildwood Dr., New Bern, NC 28562. NC residents add 6% tax. (919) 637-3416. [9/95]

SCALE PLANS AND PHOTO SERVICE: Four scale catalogues; SPPS 163 Superscale Plans, SPPS Documentation Photos, 3-views, Argus Scale Plans Handbook, Argus 3-view Scale Drawings. The Best! $5 each USA and Canada. $10 each overseas Air. SASE for enlarging prices. Jim Pepino's Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; phone/fax (910) 292-5239. Visa, Mastercard. [12/95]

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LIFETIME COLLECTION of over 600 model airplane and a few car kits of all types. $4,000 firm. For more information, call or write: David Wilson, P.O. Box 189, Reynoldsburg, OH 43068; (614) 491-3718. [9/95]

PLANS ENLARGING. Old model magazines, scanning, plotting, model software. Free information. Concept, P.O. Box 669A, Poway, CA 92074-0669; (619) 486-2464. [11/95]

FOR SALE: Older 6-channel MRC radio series 7662, 3 servos, 72.400MHz, needs batteries. $40 + postage. Hemostats: S.S., 5 inch, 2/$6 or 4/$10 + postage. Wanted: Frequency monitor or spectrum analyzer. Don Springer, 99 Lerma Court, Kissimmee, FL 34743. [9/95]

FOR SALE—OPS B-20 twin marine—very rare. Approximately 113 built by Picco. See 11/76 *Model Airplane News* for engine review and specs. Never-run twin tuned pipes and custom cedar box included. Chuck (eves)—(408) 659-5138. [10/95]

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PAYING $60 to $125 each for toy metal outboard boat motors: Gale Sovereign, Johnson, Mercury, Oliver, Scott, Evinrude, Sea-Fury single and twin. (616) 941-2111; Richard Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686. [9/95]

FLAPERONS, elevons, vee-tails, wings, dual throttles, need the MicroMixer. Tiny 1/3 ounce. Airborne computer mixing for standard radios! Without connectors, $29 assembled, $21 kit; $2.25 shipping. Quillen Engineering, 561 N. 750 W., Hobart, IN 46342; (219) 759-5298. [10/95]

GIANT-SCALE KITS: From Jim Meister Plans. P-51, Spitfire full wood kits. 109, Corsair, 190, P-47 semi-kits. Squint scale 81", P-40B from Tim Farrell Flight Plans. Custom cutting also available. Send SASE to Starlight Hobbies, P.O. Box 626, Stone Ridge, NY 12484-0626, or call (914) 687-4737 between 6-10 pm. [9/95]

GEE BEE plans (Benjamin used). Twelve airplanes, 1/3, smaller. Shirts! Catalog/News $4. Vern, 308 Palo Alto, Caldwell, ID 83605; (208) 459-7608. [10/95]

COLLECTION FOR SALE: Over 350 kits from 40's, 50's, 60's, F/F, R/C, U/C, Rubber, Solids, Jetex. Send SASE ($.55) to Dr. Frank Iacobellis, 62 Palisade Rd., Rye, NY 10580, or call (914) 967-5550. [1/96]

ENGINE KITS, magazines, air classics, wings, airpower, 1940-60 auto magazines, model engine kits, etc. Want .60 engines. SASE for list. Genevro, 2050 Christina St., Salem, OR 97304. [9/95]

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MODELMAKERS, COLLECTORS: Aviation packets for sale. Plans, 3-views, cutaways, drawings, engines, racing A/C, etc. $5 to $16. Send $1 and SASE for info. Doug Worthy, 1149 Pine, Manhattan Beach, CA 90266. [1/96]

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GERMAN AIRCRAFT WW II—handbooks, service-parts lists, instruction manuals. List for $2. Udo E. Hafner, Konigsallee 69, D-71638 Ludwigsburg, Germany. [2/96]

MAKE REAL DECALS with your computer and printer. Send $10 for introductory kit to: LABCO, Dept. MAN 27563 Dover, Warren, MI 48093. [2/96]

ULTRASMOKE! Better than any other smoke oil! Will not harm paint, covering or foam. Creates brilliant white billowing smoke. $42.75 for four gallons including freight. Send check to ULTRA-SMOKE, 11600 Kent, Wichita, KS 67209; (316) 721-3864. [11/95]

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BYRON F-15, O.S. 91s, Futaba Super 7 radio, incredible finish—$3,000; Byron P-51, Q-40 gear reduction, Futaba 7UAP radio, retracts, ready for paint—$2,000; BVM F-16, BVM-91, Futaba 7UAP radio, all options, with gyro, never flown, General Dynamics paint scheme—$3,200; BVM Viper, BVM-82, retracts, Futaba 7UAP radio, ready for paint—$2,200. Call Rick at (203) 748-2799 days; (914) 667-9360 evenings. [10/95]

WANTED: 1950's Piper Tri-Pacer gas-powered control-line model by Comet; (610) 458-5796. [11/95]

WANTED: Old gas-powered model racecars with or without engines. Richard Gronowski, 140 N. Garfield Ave., Traverse City, MI 49686; (616) 941-2111. [10/95]

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MODEL AIRPLANE KITS. For sale, 35 kits of the '40s to the '60s, balsa and plastic. Planes no longer made, (as the Howards "Pete," Ryan ST, Monocoupe Citabria, peanut scale). For entire listing, send an SASE to R. Franks, 327 North Eighth St., Lehighton, PA 18235. [9/95]

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AVIATION HISTORY CATALOGUES: old, used, rare and out-of-print books on aviation, WW I, WW II, Korea, etc. To order catalogue, send $1 to: Q.M. Dabney & Co., Inc., Box 42026-AA, Washington, DC 20015. [2/96]

FUN FLY NATIONALS - Sept. 2&3 at Henderson R/C Club Field in Robarts, KY. Contact CD Harold Parker at 2396 St. Rt. 2836, Providence, KY 42450; (502) 667-5486. AMA & NCFFA membership required. National Competition Fun Fly Association. [9/95]

WANTED: WEBRA 90 ENGINE with factory cast aluminum gear reduction with hectical cut gears. Durbo belt drive gear reductions. After 5pm: (901) 373-3950. [10/95]

DUMMY ROUNDS! .50 caliber BMG, $5 each, 20MM cannon, $10 each, 30MM Cannon, $15 each, or all 3, $27 includes shipping. Check or money order to, G. Young Enterprises, 6336 North Oracle Rd., #326-108B, Tucson, AZ 85704. No orders outside U.S. [11/95]

GLENNIS AIRCRAFT - Now offering over 460 different sizes and styles of wheels and tires for whatever model aircraft you are flying, building or dreaming about. If you have not seen or heard about our new products for '95, you should call (916) 742-3957 for more info, or send $5 to Glennis Aircraft, 5528 Arboga Rd, Linda, CA 95901 for 1995 catalogue. [9/95]

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SALE—Engines, kits, radios, accessories, 35-year accumulation. Johnsons, Veco, Torpedo, Rossi, etc., Speed, Carrier and Sport. Also late 4 cycles. For list, send #10 SSAE to E. Wielms, #E4, 1810 Gulfshore Blvd. N., Naples, FL 33940-4967; (941) 261-8498. [10/95]

WANTED: Inexpensive, good condition radio system, training R/C airplane, servos, engines, propellers, etc. Send photos and specs to Vic Snyder, 1710 Kingsley Dr., Colorado Springs, CO 80909. [9/95]

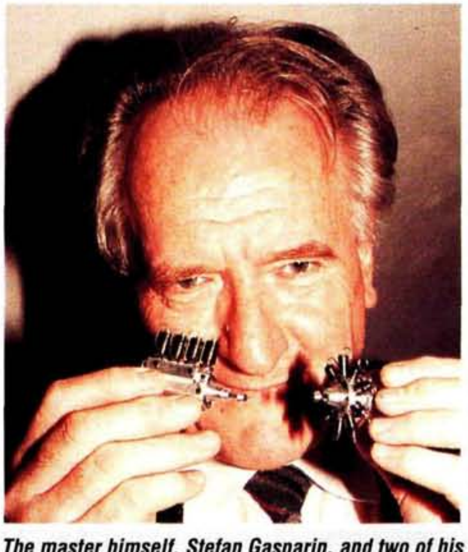
ENGINES FOR LESS: New and used save big money! O.S., Supertigre, Fox, Enya, K&B, McCoy, Saito & more! All used engines come with **lifetime tradeback guarantee!** Consignment sales, Trade-in's too! Send legal-size S.A.S.E. to get free list or postage to: HWC, P.O. Box 94, Boystown NE 68154. [11/95]

FINAL APPROACH

FLYING MINIATURES

Ricany is a small and quiet, old-style city just a 15-minute drive from the southern suburbs of Prague, the capital city of the Czech Republic. There lives one of the most respected masters of miniature modeling—Stefan Gasparin. His workshop is about the size of a legal paper pad.

Inspired by an article in the famed *Aeromodeller Annual* ('72/'73 edition) that documented Bill Brown's CO_2 engines, Gasparin started building his own miniature engines. His first motor was ready and running in 1973. Its capacity was a gigantic 100mm³ (.0061 cubic inch) with a 5mm bore. Another engine of half this capacity followed quickly, then a flat twin version.

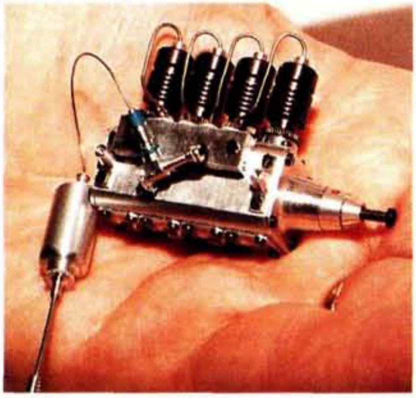


The master himself, Stefan Gasparin, and two of his latest creations, both very large motors by his standards. Left is the G63L4 4-cylinder in-line motor with a total capacity of .0157 cubic inch (bore—.157 inch, stroke—.197 inch); it weighs an enormous 1.44 ounces. Right: the unique .0134ci, 9-cylinder rotary engine (bore—.125 inch, stroke—.118 inch, weight—1.21 ounces), which was first presented at the London Model Engineer Exhibition in January 1994.

This is the first production GB-12 produced by Bill Brown in cooperation with Stefan Gasparin. This engine, like all Bill Brown productions, uses a die-cast crankcase.

Can you believe this photograph? Here are parts (crankcase, cylinder, connecting rod, cylinder housing and adjustment nut) from Gasparin's smallest—the G1 with .0000560ci capacity. Bore—1mm (.039 inch), stroke—1.2mm (.047 inch). This engine is three times smaller than the G3, which stands in the "Guinness Book of World Records"!

Many engine designs later, and after the fall of the Iron Curtain, the G-Mot and Gasparin Engine companies were created to market his miniature powerplants (his more specialized miniatures are distributed in the U.S. by Hobby Lobby*). One of Stefan's engines—a 3mm³ marvel—is in the "Guinness Book of World Records," although his smallest is now the G1 with only .92mm³ capacity (.0000560 cubic inch) and a 1mm bore. This latest engine is made for sub-size indoor scale models (around a 5-inch span!).



The latest: a 4-cylinder in-line, which was first presented during the Model Hobby Model Show in Prague last September. It looks enormous compared with the G3, which appears in the "Guinness Book of World Records."

Last year, Gasparin produced a small flat-four, two types of 3-cylinder radial engines, a nice 9-cylinder radial and, interestingly, a 9-cylinder rotary engine! Such engines are not cheap, of course, but they are, in effect, wonderful pieces of working modeling jewelry.

When you see them buzzing aboard a minute R/C scale model, you just long to fly your own at home. Yes, it can be done, and you can expect from Stefan Gasparin even more astonishing miniatures in the future!

—Guy Revel

Powering this extremely miniature Flying Flea (it spans a mere 4.33 inches) is one of the world's smallest reciprocating engines. Built by Rainer Gaggl of Graz, Austria, this CO_2 engine at .79 cubic millimeter (.0000493 cubic inch!) is slightly smaller than Stefan Gasparin's smallest, and it runs full bore at 13,000rpm. The complete free-flight model weights .03 ounce, of which .0175 ounce accounts for the engine, complete with tank and prop. Best flight to date is 140 seconds in a 40-foot-ceiling room on September 7, 1994. Who will improve on this incredible record? (Photograph by Walter Hacht via Stefan Gasparin.)

Yes, this Taylor Cub is radio-controlled, and the equipment has been entirely made by Gasparin, of course! Would you believe it's restricted to indoor flying? Gasparin-Brown GB-12 motor; total flying weight—1.33 ounces.

The underside of the Taylor Cub reveals the single-channel radio equipment. The two miniature button cells powering the unit look gigantic compared with the non-proportional servo.